UTOPIA COMPUTER

The »New« in Architecture?

Nathalie Bredella, Chris Dähne,
Frederike Lausch (Eds.)

Forum Architekturwissenschaft
Band 6

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NETZWERK
ARCHITEKTUR
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The critical concern of the book “Utopia Computer” is the euphoria, expectation and hope inspired by the introduction of computers within architecture in the early digital age. With the advent of the personal computer and the launch of the Internet in the 1990s, utopian ideals found in architectural discourse from the 1960s were revisited and adjusted to the specific characteristics of digital media. Taking the 1990s discourse on computation as a starting point, the contributions of this book grapple with the utopian promises associated with topics such as participation, self-organization, and non-standard architecture. By placing these topics in a historical framework, the book offers perspectives for the future role computation might play within architecture and society.

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Houses of Ice

Raster Utopias and Architecture's Liquid Turn

This paper proposes the utopian visions of Italian architects Leonardo Mosso and Laura Castagno Mosso as prescient models for architecture in the age of statistical thinking. Orthography has dominated architecture since the renaissance, but digitalization has ushered in an epoch of the mutable, addressable, and liquid image. This epistemological shift was anticipated in the late 1960s by the Mossos as they envisaged another inherently dynamic medium: the city. The paper interrogates the techno-cultural and political contexts of the Mossos and how this unique environment contributed to their radical architectural visions that presciently suggested architecture's impending liquid turn.

"I am to build a house of ice
Because it is more liquid."
Kurt Schwitters, My House

Borrowing from epistemological shifts suggested by architectural theorist John May, this paper proposes the utopian visions of Italian architects Leonardo Mosso and Laura Castagno Mosso as prescient models for architecture in the age of statistical thinking. The paper explores the techno-cultural and political contexts of the Mossos' work and how this unique environment influenced their development of utopic visions for the Information Age that presciently suggested architecture's impending liquid turn. A recurring motif in this discussion is the pixel, a notational element that helps bridge the architectural epistemologies of orthography and signalization offered by May.[1] In their pixelated utopic visions, the Mossos' replace idealized, crystalline form-making

with mutable, flowing models capable of adapting to shifting conditions in real time. In this way, this essay rehearses one possible story of architecture's phase change from ice to liquid.

An elegant and expedient protocol of graphic encoding and transmission, the pixel is defined as the smallest addressable element of an image. The pixel is a ubiquitous cultural touchstone today, but the term was first introduced in technical circles in the mid-1960s—as a portmanteau of the terms "picture" and "element." This etymology is misleading, however, as pictures and images have very little in common on a technical level. This ambiguity has been delineated by architect and theorist John May, who re-assesses architecture's technical basis to discern between drawings, photographs and images, terms often used somewhat interchangeably inside and outside architecture, as incompatible technical formats. In his 2017 essay "Everything Is Already an Image," May distinguishes between the three technologies with concise technical definitions: drawings as outlines of hand-mechanical gestures, photographs as a form of heliography (writing with the sun), and images, produced by "a process of detecting energy emitted by an environment and chopping it into discrete, measurable electrical charges called signals, which are stored, calculated, managed, and manipulated through various statistical methods."[2] May goes on to note: "Images are inherently dynamic, and our tendency to think of them as static or fixed is a result of the psychohistorical residue of drawings and photographs."[3] Architecture since the Renaissance has been dominated by the conventions of orthography, but design has entered an epoch of the mutable, addressable and liquid image. This radical shift was anticipated in the late 1960s by a pair of young, radical Italian architects exploring another inherently dynamic medium… the city.

In 1969, Turin-based architects and educators Leonardo and Laura Mosso from the Politecnico di Milano published *Programmierte*

1 John May, Signal. Image. Architecture (New York/NY: Columbia University Press, 2019), 80.

2 John May, "Everything Is Already an Image," Log, no. 40 (Spring/Summer 2017): 12.

3 Ibid.

Fig. 1: Laura and Leonardo Mosso, *Programmierte Architektur* cover, 1968

Architektur, a utopian manifesto advocating for a radical form of computationally-mediated "direct architecture."[4] The pair's cybernetic "self-managed" city speculates on the shape and growth patterns of cities that employ computers to help citizens collaboratively administer large territories. The Mossos' term "territories" is important here, as their work explores not only the city, an obsession of modern architecture, but outlying areas as well. We will return to the political, ecological and architectural

4 Umbro Apollonio, Leonardo Mosso and Carlo Belloli, Leonardo Mosso – Programmierte Architektur (Turin: Studio di informazione estetica, 1969), 69.

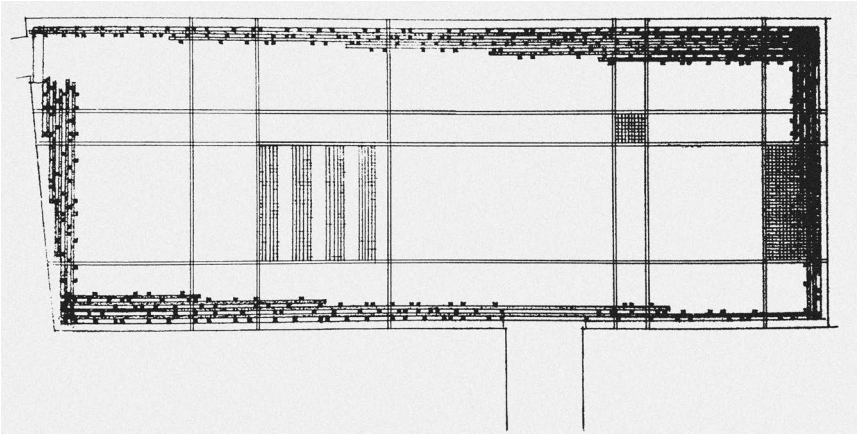

Fig. 2: Laura and Leonardo Mosso, Chapel for the Artist's Fair, 1962. Source: Laura and Leonardo Mosso, *Programmierte Architektur* (Studio di Informazione Estetica und Vanni Scheiwiller: Torino, 1969), 37

ambitions of the project, but for a moment let's first briefly consider the most obvious and striking visual motif of the Mossos' book: the aforementioned pixel.

The slim volume's square cover is punctuated by a staccato pattern of black squares resembling mainframe punch cards (fig. 1). Inside, *Programmierte Architektur* documents three projects of distinct architectural scales: the room, the building and finally the city. The first project is a modest chapel (1962, fig. 2) followed by a civic governmental building on an irregular site (1966, fig. 3) and finally the *Continuity* project, a vision of a new self-managed city and the focal point of this essay (1968, fig. 4). The Mossos used the successive scale of the projects to explore the variety of concerns that a built environment rendered in a discrete, voxelized architecture could generate.[5] The chapel project, for example, includes exquisite details of a tectonic joinery system for producing flexible, pixelated frameworks. This work echoes Leonardo Mosso's personal research and teaching experiments

5 In computer-based modelling and computer graphics, voxels are single three-dimensional units of space. In other words, voxels are the three-dimensional version of 2D graphic pixels.

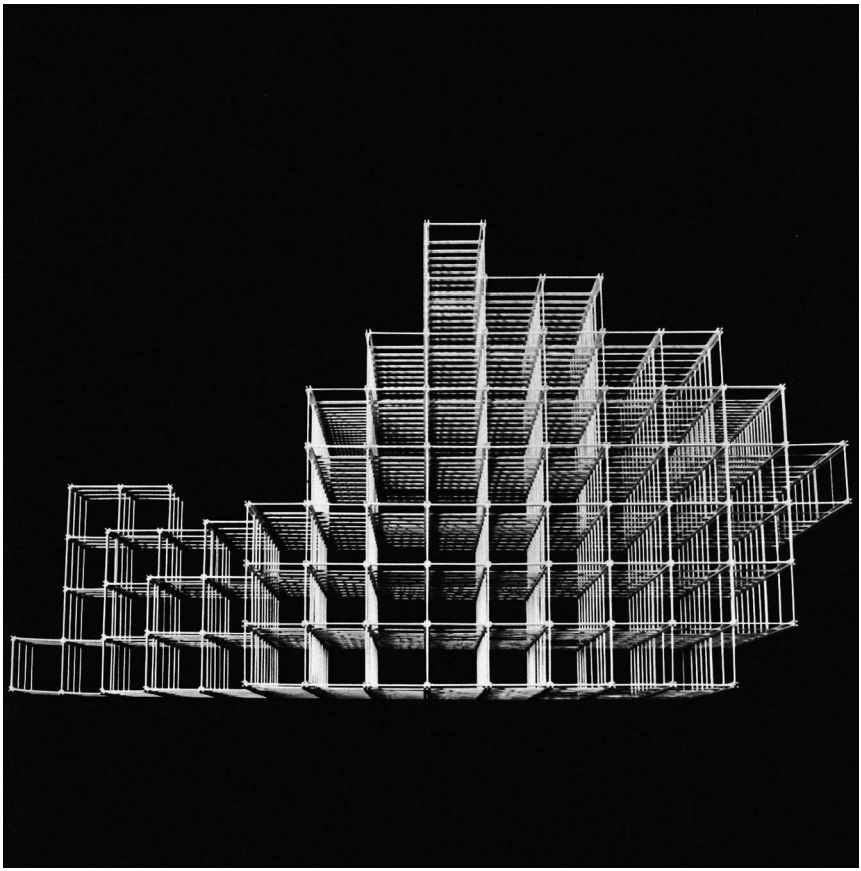

Fig. 3: Laura and Leonardo Mosso, “Testimonianza,” 1966–1967. Source: Laura and Leonardo Mosso, *Programmierte Architektur* (Studio di Informazione Estetica und Vanni Scheiwiller: Torino, 1969), 47

with flexible joints to produce participatory frames for communal design activities.[6] The civic building interrogates the programming of a voxelized building fabric. Finally, the self-managed city envisions a sustainable, constantly evolving city where acts of construction and deconstruction are equally valid.

6 For more see Britt Eversole, “The Politics of Self-Organization,” Dimensions 23 (2010): 81–92.

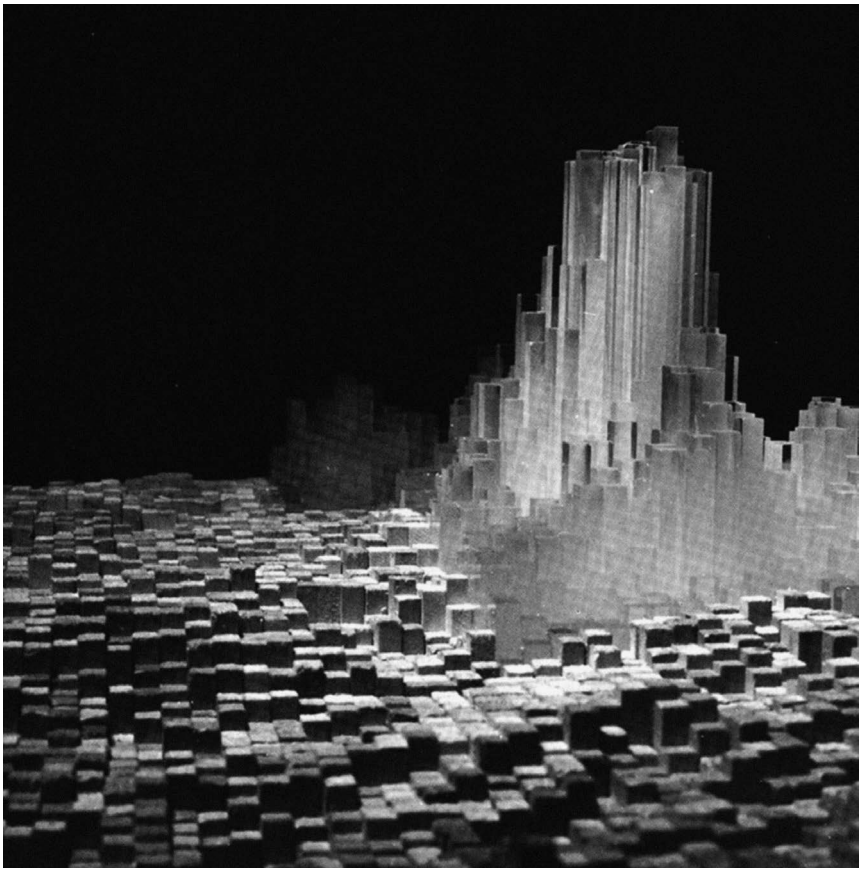

Fig. 4: Laura and Leonardo Mosso, "Continuity," 1968. Source: Laura and Leonardo Mosso, *Programmierte Architektur* (Studio di Informazione Estetica und Vanni Scheiwiller: Torino, 1969), 90

Programmierte Architektur proposes a radical reorganization of a European civic order fundamentally altered by the forces of industrialization only a generation prior. In the euphoria for a new rational, technical architecture in the 1920s and 1930s, architects Ludwig Hilberseimer, Walter Gropius and other members of the New Objectivity movement systematized architecture through geometric discretization, echoing the logics and protocols of the assembly line.[7] A premise of Hilberseimer's decentralized city planning was to break architecture down to its most fundamental elements: finite units of space that would resist any

further division. As Italian architect and historian Manfredo Tafuri notes, from the perspective of this work, buildings were no longer objects, but merely, "the place in which the elementary assemblage of single cells assumes physical form."[8] Hilberseimer's discretization of the city challenged the notion that architecture was a discipline of creative or aesthetic inquiry, establishing instead repeatable spatial formulas based on mass production principles of standardization and serialization. His work in architecture and urbanism broke the built environment down to its most irreducible addressable units. In many ways, Hilberseimer's work can be understood not only as a rationalization of architecture based on the principles of industrialization, but also as a preparatory step for architecture's looming change in state from ice to liquid.

New Objectivity architecture followed the model of elementarization established by painting, which by Hilberseimer's account was the first discipline "to call attention to the basic forms of all art: geometric and cubic elements that resist any further objectification."[9] In the Concrete Art Manifesto of 1930, Theo van Doesburg promoted mechanically-controlled, logical and universal methods of representational control to delineate and describe a finite set of abstract elements.[10] The mechanization of expression utilized new production techniques to assuage a desire for the erasure of sensuality or sentimentality. These techniques were part of a larger strategy to disembody and standardize graphic communication, laying the groundwork for further efforts to universalize language in art and architecture and ambitions to unify the artistic fields. In post-war Central Europe, this groundwork was the platform for the Information Aesthetics Movement.

Information Aesthetics was a Central European movement co-founded and synthesized by Professor Max Bense of the University of Stuttgart and French engineer and philosopher Abraham Moles in the late 1950s. A radical and nebulous

7 Manfredo Tafuri, Architecture and Utopia (Cambridge/MA: MIT Press, 1979), 101.

8 Ibid., 105.

9 Ibid., 108.

10 Lorenza Saitta and Jean Daniel-Zucker, Abstraction in Artificial Intelligence and Complex Systems (New York/NY: Spring Verlag, 2013), 414.

transdisciplinary field, Information Aesthetics combined features from the philosophy of science, logic, aesthetics and semiotics. The movement considered the creative and aesthetic potential of cybernetics and communication theory through writing, research and art practice. The movement's most well-known work includes the early generative computer art of pioneering artists like Georg Nees, Max Bense's doctoral student at the University of Stuttgart. As movement protagonist and informal historian Frieder Nake notes, "the intention was to establish an objective aesthetics of measure, as opposed to a subjective aesthetics of value."[11]
Information Aesthetics gained influence beyond the Stuttgart School through associations with the HfG Ulm, where Bense also taught, and the New Tendencies movement. Early pioneers of computational design like Manfred Mohr, Frieder Nake, Georg Nees, Helmar Frank, Elizabeth Walther Bense, Almir Mavignier and Kurd Alsleben moved between institutions, establishing a network of algorithmic pioneers exploring the aesthetic and creative potential of computers.[12] Based in Zagreb, Croatia, in the former Yugoslavia, New Tendencies was the epicentre of a larger computer art movement and combined features of European abstraction and information theory in a series of exhibitions and symposia exploring Concrete, Constructive, Kinetic, Optical and Algorithmic art. The Mossos' exhibited their *Continuity* project at New Tendencies 4. An unedited draft of their presentation appears in Margit Rosen's book, which documents the proceedings.[13]
Foundational to Information Aesthetics was US mathematician Claude Shannon's 1948 essay "A Mathematical Theory of Communication," which first defined information as transmittable, quantitative and probabilistic. The aesthetic regime of early Information Aesthetics work was influenced by the hard-edged, rigid, disembodied and systemized work of Concrete Art, but

11 Frieder Nake, "The Semiotic Engine: Notes on the History of Algorithmic Images in Europe," Art Journal 68, no. 1 (2009): 80.

12 For more, see the compart daDA: the database Digital Art, a project of the University of Bremen, Germany and available online at http://dada.compart-bremen.de/.

13 Margit Rosen, ed., A Little-Known Story about a Movement, a Magazine, and the Computer's Arrival in Art (Cambridge/MA: MIT Press, 2011), 427.

distinguished itself from prior movements through the introduction of entropic compositional themes and the use or simulation of computers. Take for example Swiss architect and painter Max Bill's "Weisses Quadrat," painted two years prior to Shannon's epoch launching essay (fig. 5). Bill populates the picture plane with a 9x9 grid of 81 pixels, converting the pictorial plane into a probabilistic field. The single white pixel among the field of black squares suggests a change of state—1 out of 81 possibilities. Bill's pixelated painting is delineated under the conventions of orthographic projection but suggests an inherently dynamic picture field and can be understood as a bridge between Concrete Art and Information Aesthetics.

The compositional plane as a probabilistic field is epitomized in the work of another New Tendencies protagonist, Vladimir Bonačić, a Croatian installation artist from Yugoslavia who designed and fabricated a series of "dynamic objects"—large raster light fields experimenting with programmed patterns of light and sound. Bonačić's dynamic objects ranged in size from small installations to large-scale facades and were based on pseudo-random numbers derived from Galois Fields.[14] Bonačić worked directly with machines and his work was fulfilled in real time, something that distinguished him from many of his contemporaries in the New Tendencies movement. As German historian of early computer art, Darko Fritz, calculates, patterns in Bonačić's flickering pixelated light fields might reappear in the system—but only after 247 years.[15] In this work, the plurality of equally possible events is key. Time is conceived not as a linear process, but an overlay of many possible events all equally possible, but variable in terms of probability.

It's important to qualify at this point that the Mossos' *Continuity* is perhaps best understood as a pedagogical articulation of values

14 For a technical description of Galois Fields and their use in his work, see Vladimir Bonačić, "Kinetic Art: Application of Abstract Algebra to Objects with Computer-Controlled Flashing Lights and Sound Combinations," Leonardo 7, no. 3 (Summer 1974): 193–200.

15 Darko Fritz, "Vladimir Bonačić: Computer-Generated Works Made within Zagreb's New Tendencies Network (1961–1973)," Leonardo 41, no. 2 (April 2008): 178.

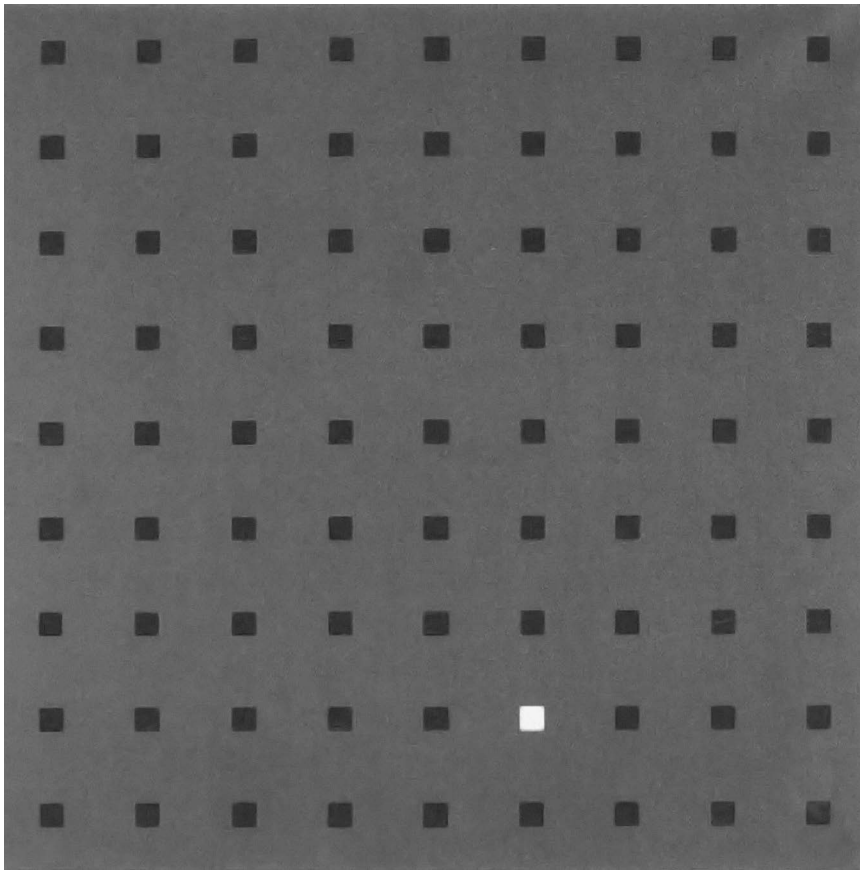

Fig. 5: Max Bill, Weisses Quadrat, 1946. Source: Margit Rosen et al., *A Little-Known Story about a Movement, a Magazine, and the Computer's Arrival in Art* (ZKM/Center for Art and Media, Germany 2011), 45

rather than a successful model for architecture. If Hilberseimer's *Großstadtarchitektur* embodied the impact of mechanistic forces of industrialization on architecture, *Continuity* extrapolates Information Age tendencies and infers their possible consequences. While the text of *Continuity* reflects the euphoria around cybernetic tools in the early 1960s, the Mossos remained notably cautious compared to the hyperbolic claims of their contemporaries. Their "Manifesto for Direct Architecture," reprinted in several European journals, begins with an articulation of the pair's

prescient anxieties over modern socio-political and ecological imbalances that computation would only further exacerbate. The text begins with a restrained optimism uncharacteristic in conventional architecture manifestos stating: "We are fully aware that without the aid of cybernetic, logical and mathematical tools it is inconceivable that man might overcome present-day ecological and eco-social complexities. Nevertheless, our first preoccupation concerns the ethical and political use of such tools."[16]

Their list of concerns for the fate of post-war cities are disconcertingly familiar to the contemporary reader: existential environmental threats, themes of alienation and dehumanization deepened by the division of labour, concern over growing economic and social imbalances and finally, the threatening spectre of nationalism. Like British architect Christopher Alexander, the Mossos sympathized with the anti-architecture movement and their text is particularly suspicious of elites and experts in matters of the built environment. In short, the Mossos' *Continuity* is an institutional critique of disastrous post-war planning policies which were incapable of assuaging the social and ecological pressures of the late 1960s. Their criticism echoes Tafuri's critique of Hilberseimer's precise and rational conception of new civic unity, which was similarly disrupted by the inconvenient contingencies of the post-war period. As Tafuri writes: "Improbability, multifunctionality, multiplicity, and lack of organic structure - all the contradictory aspects assumed by the modern metropolis… [that] have remained outside the attempts at a rationalization by Central European architecture."[17]

As previously discussed, Hilberseimer's project for the city extended from a fundamentally orthographic tradition of architecture based on a mechanical, linear conception of time. His redundant and logical structures were immutable typologies incapable of responding to the chaotic behaviour and imbalances of the modern city. By contrast the Mossos's *Continuity*

16 Leonardo Mosso and Laura Mosso, "Self-Generation of Form and the New Ecology," Ekistics 34, no. 204 (1972): 316.

17 Tafuri, Architecture and Utopia, 124.

is an Agonistic Utopia: the scheme is indeterminate, non-linear and anti-teleological. The Mossos describe a system of self-management protocols wherein the shape of the urban fabric continuously responds to the decentralized pressures of local conflicts. *Continuity* is not a fixed utopian plan or type, but rather a proposal for a non-figurative territory of architecture that continuously emerges through unpredictable, chaotic and ceaseless change. Their concrete utopia replaces Hilberseimer's blank and static tabula rasa with a noisy, random data landscape constantly fluctuating in real time. Their urban territory is a rich substrate of signals generated by contingencies, relationships and mutable information.

The Mossos' non-figurative design model embraces improbability, multifunctionality and multiplicity as inevitable phenomenon not to be assuaged or smoothed by architecture, but as inextricable traits of the new civic models made possible by responsive computers. The mutability of *Continuity* might suggest form-finding projects, but the Mossos' city is not evolving toward an ideal fitness or efficient model. *Continuity* unfolds over time in an emergent pattern of development that does not resolve in efficient or fit forms, nor into biological homeostasis, but instead embraces the perpetual, unending, noisy agonism of the metropolis. *Continuity* envisions acts of construction and destruction as equally important parts of the city's "self-management."

For the Mossos, "the random was a means of planning dynamic decentralization."[18] Decentralization was an essential tenet of "workers' self-management," a Yugoslavian political concept championed by Josip Tito's advisor, Edward Kardelj, who saw a decentralized self-management model as a first step towards a new direct democracy, a position with which the Mossos sympathized. As Kardelj writes: "The source, cornerstone and ultimate objective of the democratic system of socialist self-management is not the abstract political citizen of the political system

18 Eversole, "Politics," 89.

of bourgeois society and its parliament, but rather a person who lives, works and creates in specific social conditions and whose interests arise from his position in society."[19]

For the Mossos, an agonistic techno utopia offered the possibility to construct "citizens" rather than "users"; they hoped that their desired condition of self-conscious society might be achieved by a "personal and collective generation of form."[20] Their *Continuity* is a pedagogical demonstration of decentralized structural planning wherein architects design not speech acts, but entire languages or systems that allow the shape of the built environment to be collaboratively designed. Extending the linguistic metaphor further, by proposing a language rather than distinct speech acts, the architects aspired to allow citizens new modes of self-expression through choral acts of collective design and construction. The Mossos likened these cyclical constructive and destructive communal activities to the pedagogical structure of Swiss psychologist Jean Piaget's constructivism theory, which suggests a civic learning model based on experience rather than hierarchies of expertise. The choral construction of urban territory suggested by *Continuity* aligns perfectly with Piaget's theory of communal learning as a cyclical model with alternating periods of experimentation and reflection.

Continuity is not the "ideal city" in the Renaissance tradition of utopic, harmonic cities, but rather a schema for the city as a database in real time. If Hilberseimer dissolved the architectural object into a collection of orthographic pixels, the Mossos extrapolated architecture's indivisible units across the dimension of time: they dissolved architecture's temporality within the milieu of Information Aesthetics. Of course, the Mossos worked decades before widespread access to computers, and were required to develop their own aesthetic regimes for representing liquid urbanism. Without real time simulations or models, they had to rely on representations based on the technical gestures of

19 Edvard Kardelj, Self-management and the Political System (Belgrade: Socialist Thought and Practice, 1980), 174.

20 Mosso and Mosso, "Self-Generation of Form," 319.

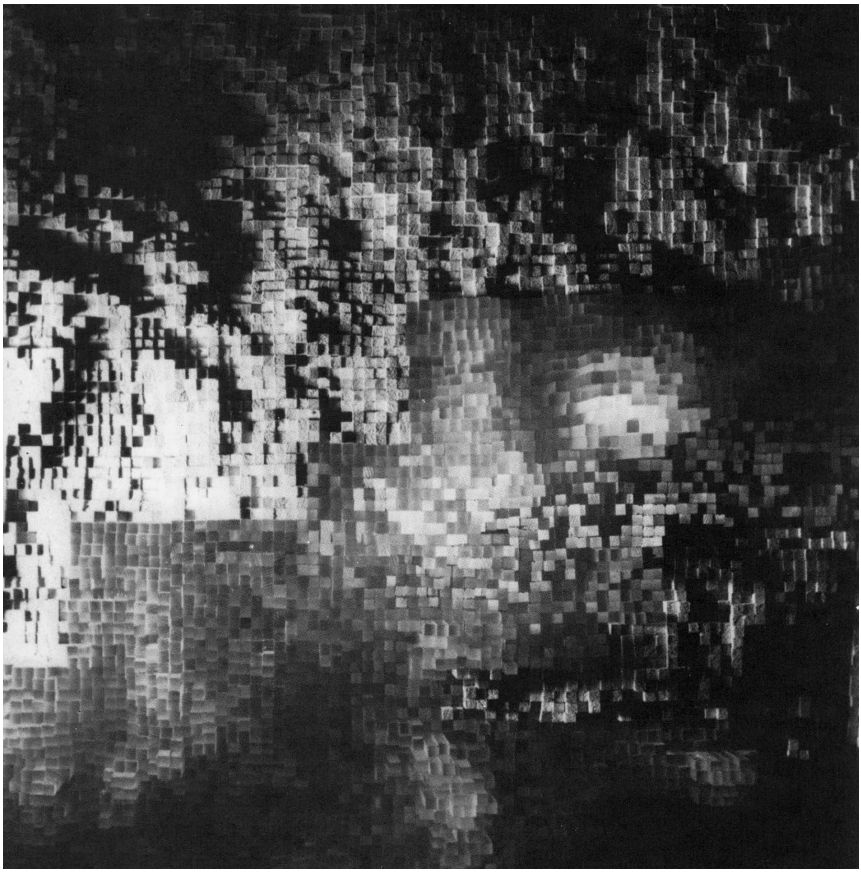

Fig. 6: Laura and Leonardo Mosso, “Continuity,” 1968. Source: Laura and Leonardo Mosso, *Programmierte Architektur* (Studio di Informazione Estetica und Vanni Scheiwiller: Torino, 1969), 68

traditional orthographic projection. *Continuity* is rendered with a series of extraordinary models in order to overcome these limits. Each model is assembled from thousands of individual wooden and plexiglass dowels, which provide snapshots of an agnostic city frozen in time (fig. 6). In order to provide a computational basis for their models, Laura and Leonardo Mosso experimented with a series of simulations on a UNIVAC 1109 at the Milano Politecnico (fig. 7).

Experimentation with liquid architecture extended to the architects of the New Tendencies movement without direct access

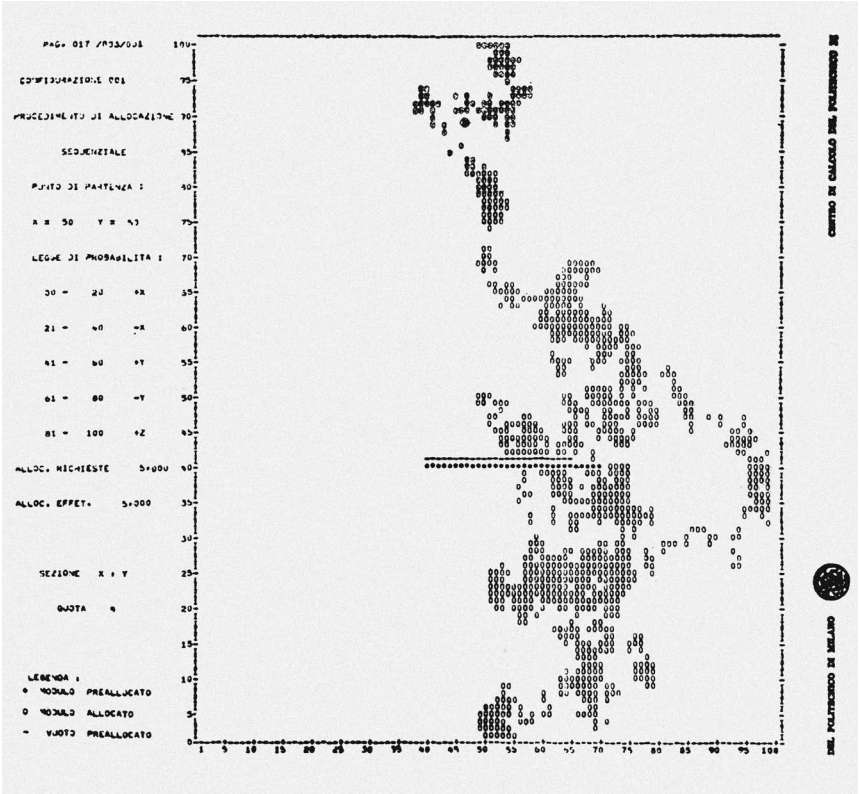

Fig. 7: Laura and Leonardo Mosso, “Continuity,” 1968. Source: Leonardo and Laura Mosso. Photograph: author

to computers or technical expertise as well. As part of the New Tendencies event “Colloquy [of] Computers and Visual Research,” Yugoslavian sculptor and architect Vjenceslav Richter presented a paper entitled “Dilemma,” later reprinted in the movement’s multilingual journal *bit international* In his address, Vjenceslav Richter considers the fundamental alterations to the role of the artist or architect that occur when working with computers. Richter describes the dynamic qualities of new tools that are not “immobile,” but rather interactive and have a capacity for complexity and permutations. Richter readily admits he is intimidated by this situation, noting that he had “a feeling that on the occasion of my first encounter with a computer I shall have to apologize to

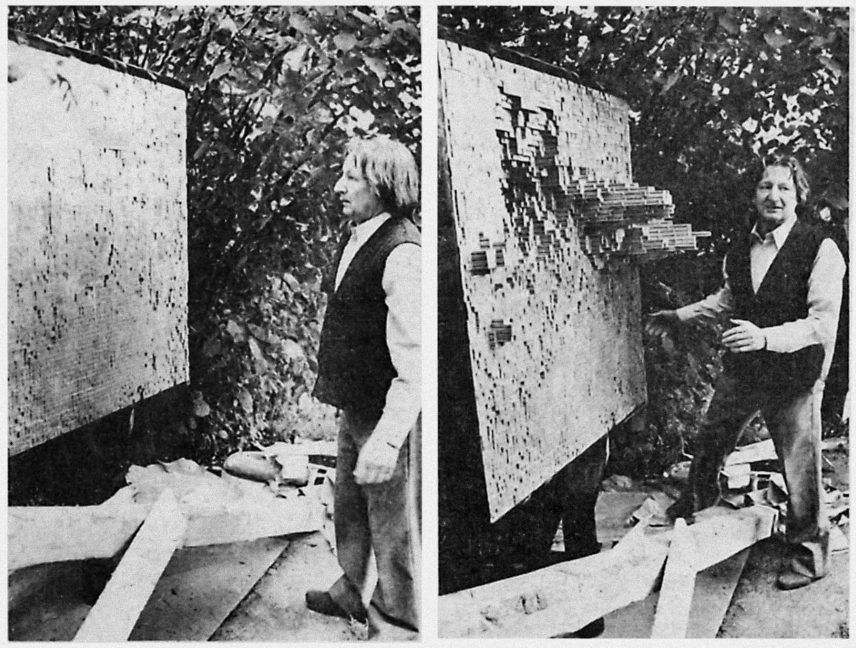

Fig. 8: Laura and Leonardo Mosso, Vjenceslav Richter and the Reliefometer, 1968. Source: *Vjesnik*. Photograph: author

it, and very politely at that, for my lack of ingenuity, uniformedness [sic] and stupidity."[21]

Beginning in the early 1960s, Richter developed his own mobile design tool, a sculptural system he termed the "Reliefometer" (fig. 8). The "Reliefometer" was an enormous metallic canvas constructed from interlocking metallic components that slid independently of one another, creating a pixelated field in which Richter could explore various relationships between individual components and the collective system. Richter's tool liberated his explorations from the limitations of existing analytical and mechanistic models of representation and played an important role in his approach as both a sculptor and architect. Richter's mobile design approach helped him to explore possibilities he

21 Vjenceslav Richter, "Dilemma," bit international 3 (1968): 27.

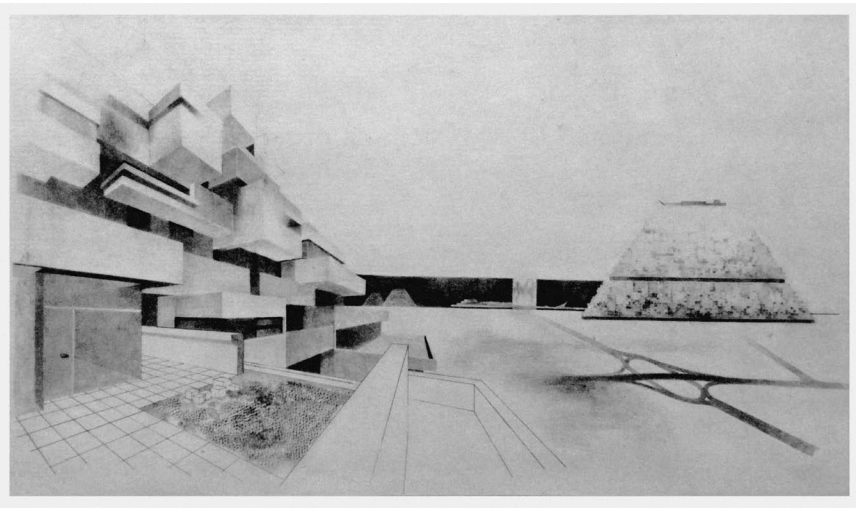

Fig. 9: Vjenceslav Richter, Synthurbanism, 1954–1964. Source: Richter Collection - The Museum of Contemporary Art Zagreb. Photograph: author

would later realize as finished works, including his *Synthurbanism* project of the early 1960s, a utopian vision for urban structures housing tens of thousands in cavernous ziggurat megastructures (fig. 9).

The prescience of the Mossos' pseudo-orthographic/pseudo-signalling architecture positions it precisely between two different epistemologies of both tools and time. Their work epitomizes a key historical moment when the computer introduced a probabilistic regime of thinking, the impact of which we are only beginning to understand. Again, we return to John May, this time from his book *Signal. Image. Architecture*: "Unlike historical time, which was predicated on technical regimes and gestures that continually related present and future to the past, real time relates the present to all possible futures at once (or at least as many as can be recorded and computed). Real time is the time of statistical thought, in which futures knowable and unknowable are posed simultaneously, some more calculably probable than others, but all possible."[22]

22 May, Signal. Image. Architecture, 83.

Rather than requiring designers to delineate using outmoded controlling technical gestures, real-time probabilistic design environments challenge today's designers to learn to play the system, to improvise, adapt and respond through abductive reasoning in a paradigm that recalls Piaget's cyclical constructivist model of learning. Through cyclic acts of civic improvisation and reflection, scores of designers collectively poke and prod to find out what is possible, whether spatially or virtually. The Mossos pioneering work presciently envisions these new design modalities, but is a useful counterpoint to the contemporary condition of statistical architecture, as their writing calls for a democratization of information and, by extension, agency in the built environment. Their work suggests we turn our attention from the city's frozen image to its liquid state—real-time urban futures that are ceaselessly calculated and stacked upon each other—infinite material that seems to thicken every day. The situation offers an opportunity for new forms of thought and imagination, particularly with a sensitivity to time, performance and temporality. Embracing this paradigmatic change might provoke more choices, not only about what we choose to build but about when we choose not to build, how long we build for and for what time we build.

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The critical concern of the book “Utopia Computer” is the euphoria, expectation and hope inspired by the introduction of computers within architecture in the early digital age. With the advent of the personal computer and the launch of the Internet in the 1990s, utopian ideals found in architectural discourse from the 1960s were revisited and adjusted to the specific characteristics of digital media. Taking the 1990s discourse on computation as a starting point, the contributions of this book grapple with the utopian promises associated with topics such as participation, self-organization, and non-standard architecture. By placing these topics in a historical framework, the book offers perspectives for the future role computation might play within architecture and society.

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