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ARCHITECTURE'S CAPACITY TO CHALLENGE AND EXTEND THE LIMITS OF OTHER DISCIPLINES

ALICANTE * 19/20/21/22 SEPTEMBER 2018

CONGRESS PROCEEDINGS

EURAU18 alicante
RETROACTIVE RESEARCH
CONGRESS PROCEEDINGS

ISBN: 978-84-1302-003-7
DOI: 10.14198/EURAU18alicante

Editor: Javier Sánchez Merina

Titulación de Arquitectura

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The Cybernetic Relevance of Architecture

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Synopsis

In his article "The Architectural Relevance of Cybernetics", (1969), Gordon Pask supported the substantial affinity between the interdisciplinary field of cybernetics and architecture. According to Pask, this affinity is not limited to the diffusion of computer-aided design (which implies the application of a cybernetic method to architecture), but is rather justified on the basis of the new point of view on machines and organisms carried by cybernetics, with the tendency to equate them on the basis of their systemic nature.If on the one hand it is therefore possible to affirm with Pask that cybernetics is relevant to architecture, it is perhaps possible, on the other hand, to overturn this statement and support the hypothesis that architecture has been and is still relevant for the development of studies on cybernetics, having represented one of the most effective fields of application.

Key words: Cybernetics, Systemic Approach, Adaptive Architecture.

1. Introduction

In his article "The Architectural Relevance of Cybernetics", published in Architectural Design 9 (1969), Gordon Pask supported the substantial affinity between the interdisciplinary field of cybernetics and architecture. According to Pask, this affinity is not limited to the diffusion of computer-aided design (which implies the application of a cybernetic method to architecture), but is rather justified on the basis of the new point of view on machines and organisms carried by cybernetics, with the tendency to equate them on the basis of their systemic nature: "[...] Architects are first and foremost system designers who have been forced, over the last 100 years or so, to take an increasing interest in the organisational (ie, nontangible) system properties of development, communication and control. Design problems were coped with as they cropped up, but for some time it has been evident that an underpinning and unifying theory is required. Cybernetics is a discipline which fills the bill insofar as the abstract concepts of cybernetics can be interpreted in archi-tectural terms (and, where appropriate, identified with real architectural systems), to form a theory (architectural cybernetics, the cybernetic theory of architecture)" (Pask, 1969).If on the one hand it is therefore possible to affirm with Pask that cybernetics is relevant to architecture, it is perhaps possible, on the other hand, to overturn this statement and support the hypothesis that architecture has been and is still relevant for the development of studies on cybernetics, having represented one of the most effective fields of application.

2. Cybernetics and Systemic Approac

The term Cybernetics was introduced by Nobert Wiener who defined it as “the scientific study of control and communication in the animal and the machine” (Wiener, 1948). The possibility of equating living organisms and machines, from a cybernetic perspective, was justified by the fact that both entities could be seen as self-regulating machines, capable of controlling (or better reducing) entropy through negative feedback of information. In fact, the first-order cybernetic systems (1945-60) were characterized by self-regulation, that is the homeostatic property that guarantees control and stability through feedback loops, constantly pursuing a goal of equilibrium through the elimination of possible unexpected events. (Yiannoudes, 2016).

In Towards a Scientific Architecture (Friedman, 1971) Yona Friedman hypothesized an architectural process in which the architect builds combinatorial lists of spatial configurations aimed at solving the problem of the connection of the spaces. Pursuing an idea of user-driven design, he proposed the use of a machine, the FLATWRITER, which would allow the end user to access these lists to configure their own home.The system operated on the negative feedback loops acts to correct any "errors", it was therefore a fist-order cybernetics.

The second wave of cybernetic theories (second-order cybernetics), by exploring the potentials of positive feedback and the capacity for self-organization of systems (von Foerster, 1975) , proposed a first conceptualization of adaptive systems (social and environmental). The best-known example of application to architecture is the Cedric Price's Fun Palace

(1961-1974), a mega-structure with recreational and educational functions, which was composed of a modular structure within which the spaces they were defined by mobile and flexible elements. Users themselves could change the configuration of these spaces thanks to a feedback cybernetic system created by Gordon Pask (Mathews, 2007).

In general, starting from the 50s and 60s, many disciplines, including architecture and urban planning, began to develop their range of systemic approaches as a basis for consolidating its theoretical and practical structure. Applied to urban planning, this approach, initially based on the Theory of Control elaborated within the framework of the Theory of General Systems, saw the city as the system to sort through a controller (the planning), a specific subsystem, charged with coordinating all the others, which acts to rebalance the system that has moved away from its goals. Subsequently, the sciences of complexity allowed the transition from the idea of a city as a product to thinking of it as a system that evolves, grows and changes in ways that could be directed and managed but hardly imposed with a top-down plan (Batty, 2010). The first step towards this change is represented by the work of Jane Jacobs, Death and Life of the Great American Cities (1961), who, in the last chapter of the book entitled "The Kind of Problem the City Is", provided a conceptual basis for his arguments defining for the first time the city in terms of organized complexity, taking into account the definition that the mathematician Warren Weaver postulated in 1948 (Bettencourt, 2013)

3. Towards an adaptive architecture

The twentieth century therefore witnessed a continuous research, in the architectural field, of ideas, techniques and strategies to make buildings, and in particular domestic spaces, flexible, able to adapt to changing needs and conditions. This research led, starting from the second post-war period, to an increasing number of architects and researchers experimenting with the application of cybernetics to the built environment, using concepts such as indeterminacy, feedback of information, self-regulation and adaptation to imagine "open" architectures susceptible of modification by users.

According to the cybernetic perspective, flexibility was neither an extension of functionalism nor its denial: since the 1960s, the concepts of flexibility and function are progressively replaced by those of adaptation and behavior. The systemic approach to architectural design has therefore brought about a new awareness of the evolutionary nature of urban and architectural systems. As Pask notes, “systems, notably cities, grow and develop and, in general, evolve(…) An immediate practical consequence of the evolutionary point of view is that architectural designs should have rules for evolution built into them if their growth is to be healthy rather than cancerous. In other words, a responsible architect must be concerned with evolutionary properties; he cannot merely stand back and observe evolution as something that happens to his structures”(Pask, 1969). The idea of an evolutionary and adaptive architecture upsets the traditional operating modes of architecture, as they imply a loss of control over the formal definition of the building. However, the development of cybernetics and digital technologies has allowed us to define new methods of

control over the design process, which doesn't contrast but makes use of the concepts of unpredictability and indeterminacy, interpreting the new knowledge relating to the behavior of Adaptive Social Systems.

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Biography

Claudia Chirianni. Claudia Chirianni is an architect, researcher, artist and computational designer. After graduating in Architecture (2010) she worked as designer in international architecture studios, including Miralles / Tagliabue (Barcelona) and Foster + Partners (London). At the same time, she began a research program in the field of Complexity Theory, Cybernetics and Computer Science resulting in a PhD research, which she currently conducts at the Department of Architecture of the Federico II University of Naples, and in an artistic production whose focus is the exploration of the aesthetic and design potentials of the concepts of randomness, indeterminacy , self-organization and human-machine interaction.