PARAMETRIC AND POLYMORPHIC STRUCTURES IN CONTEMPORARY LANDSCAPE DESIGN

STRUCTURI PARAMETRICE ŞI POLIMORFE UTILIZATE ÎN AMENAJĂRILE PEISAGISTICE CONTEMPORANE

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Abstract: *A novelty of the contemporary landscape architecture is represented by urban furnishings generated exclusively through digital techniques. For these objects the software is not only a way to visualize a three-dimensional model, but an integrated part of the design process. In the parametric design the algorithm controlled by the software platform is meant to develop a spatial structure based on the geometric elements interconnection, resulting free form objects, with a micro-organic infinite repetitive development. The parametric design in the case of the landscape design does not aim to satisfy a concrete function, but to challenge the viewer's imagination and to create an unpredictable and playful pause in the gardens and parks landscape. Spatial continuity and fluidity are generally valid concepts for these studies, sustained in theory through scientific terms from mathematics and biology, with references to abstract notions from philosophy and psychology.*
Key words: parametric spatial structures, multiform urban furniture, bionic design, contempoaray landscape design, digital design, redifining the meaning of green space.

Rezumat: *O ipostază inedită a arhitecturii peisagistice contemporane este reprezentată de utilizarea obiectelor de mobilier urban generate exclusiv prin tehnici digitale. Pentru generarea acestora, aplicaţiile software nu mai sunt o simplă modalitate de vizualizare tridimensională, ci chiar parte integrantă a procesului de proiectare. Algoritmul controlat de o platforma software este menit să dezvolte o structură spatială bazată pe interconectarea de elemente geometrice, obţinându-se astfel obiecte cu o formă liberă şi cu o dezvoltare micro-organică infinit repetitivă. Utilizarea design-ul parametric în cazul amenajărilor peisagistice nu urmăreşte satisfacerea unei funcţiuni concrete, ci provocarea imaginaţiei privitorului şi realizarea unui popas ludic şi imprevizibil în peisajul cotidian al parcurilor şi grădinilor. Continuitatea şi fluiditatea spaţială sunt concepte general valabile pentru aceste studii, susţinute în plan teoretic prin termeni ştiinţifici din matematică, biologie şi cu trimiteri la noţiuni abstracte din filozofie şi psihologie.*
Cuvinte cheie: structuri spaţiale parametrice, mobilier urban polimorf, design bionic, amenajări peisagistice contemporane, proiectare digitală, resemantizarea spaţiului verde.

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INTRODUCTION

The contemporary built environment design is no longer a simple software supported process. The digital design uses the computerized techniques as an integral part of the act of creation, and the role of the specialist- in this case the landscape architect, town planner, designer- is redefined. The man gives up his role as a god-like creator and becomes a supervisor over the digital technique controlled processes. The assimilation of the digital technologies in architectural and landscaping design creates a gap between the contemporary and the prior conventional achievements. Nowadays we can find a considerable number of evolutionary morphogenetic systems, topological geometries and non-linear spatial construction experiments.

Polymorphic and parametric spatial structures imply a multidisciplinary approach (visual arts, architecture, engineering, landscaping, town planning, natural and social sciences) and are more likely to be related to the *public space design art*, unlike any other traditional science. „The marking (...) with an expressive force (...) of the semantic concentration potential places" through these kind of inedited works of art is a complementary effect of these spatial experiments. (Kazmer, 2011) We can find a resemblance with the works of art of Picasso, Calder and Chagall through which the town planners of Chicago „achieve a transformation of anonymous urban spaces to conviviality opportunities." (Kazmer, 2011).

MATERIAL AND METHOD

Similar to the traditional building, the garden and the park are perceived in relation with the environment – natural or artificial, social and historical. Their charm resides from the moment's particularity to be in the same time playful and unusual, because the individual is, eventually, the desire's and not of the necessity's creation, as Gaston Bachelard claims. (Bachelard, 2003)

Parametric spatial structures are characterized by a number of common marks: they imply an intimate relation with the environment in which they are located and dissolution of spatial boundaries (interior-exterior, public-private). They ease a multisensorial perception of the space; they imply a smaller intervention scale and allow an easier space personalization. These objects become urban spatial landmarks, with an important role in defining a new meaning for the urban space. Even for a limited period of time, the significances of a place are reconsidered.

RESULTS AND DISCUSSIONS

Nowadays, in urban landscape, the *green element* is less perceived as a *garden* but incline to the *green space* status – the interstitial planted space, strictly ecological, without a symbolic value:" we design planted spaces from a prevalent technical - utilitarian reflex, meanwhile the different dwelling layer of significance (...) remain stranger to us. The ubiquitous of the green space and the exclusion of the garden show us a change of the perspective of the postindustrial dwelling design." (Kazmer, 2011).

Through scale reduced intervention such as pavilions, spatial structures, urban furnishing objects, the *green space* gathers a particular dynamic, being transformed into a genuine open space room (fig. 1).

Fig.1 - Polymorphic and parametric urban furnishing
Crater Lake, Kobe, Japan, 2011; authors: 24 Studio; *Visual Permeability Pavilion*, NY, SUA; authors: Columbia University
Photo credits: © 24 Studio, © Columbia University , www.archdaily.com

The purpose of a parametric spatial structure placed in a garden and urban park is to provide a multifunctional relaxing, meditation and social interaction designed area. Different areas are customized for different types of activities – private relaxation or direct human interaction.

From the impact over the public space and the landscaping design point of view we distinguish two different types of intervention: urban furnishing made through parametric techniques and complex polymorph spatial structures, which in the landscape pathway context create distinctive points of interest. The main difference between them is that of scale and proportion.

In parametric design the urban furnishings are perceive as *systemic design problems* – the furniture in no longer an isolated and standardized object. The human diversity awareness leads to various volumetric expressions design, some of then even concurrent adaptable. The starting point is a complex design process, where the parameter consists in a variety of usage demands and the site's characteristics. Relevant for these types of parametric design methods is the project developed by the Architecture Department of Columbia University,

Fig.2 - *Polymorphic*, NY, SUA, 2011; authors: Columbia University GSAPP
Photo credits: © Jennifer Chang, www.archdaily.com

consisting in a 119 interconnected wooden frames. This structure has a double oriented relaxation function and its shape cans me modified on direct contact. The mobile articulations allow progressive surface waving due to the flexible design (fig. 2).

These kinds of experiments are the implantation of an innovative technical solution, that aims to search the possibilities offered by the digital design-production techniques and the way in which these researches, set in an early stage of development, can become viable solution. The results from these researches are versatile, adaptable according to the context, repeatable and reversible.

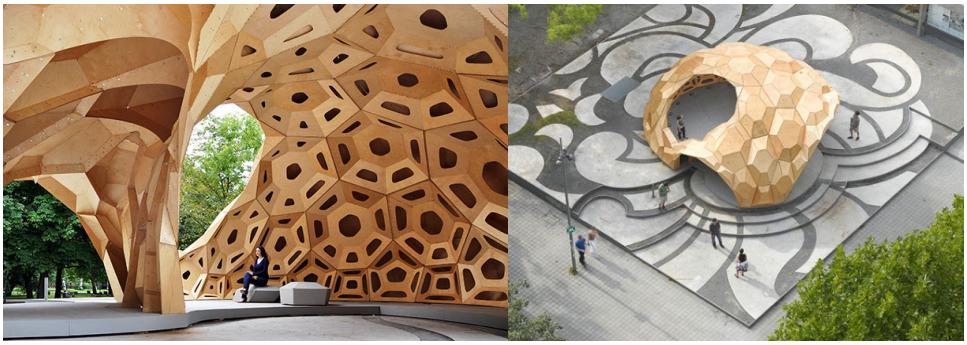

Fig.3 - *Research Pavilion,* 2011, Stuttgart, Germany; authors: ITKE University of Stuttgart
Photo credits: © ITKE University of Stuttgart, www.archdaily.com

At Stuttgart University, in the summer of 2011 was developed a transient spatial structure that had as a starting point a bionic research (fig. 3).

The main target of the project was the transfer of the biological morphological principles of the sand dollar shell to the spatial structure. The digital design, three-dimensional simulation and the production computerized supervision were integral parts in the project. The purposes of this project were to obtain a full integration and a morphological adaptation of the biological cells in the three-dimensional structures design and a real scale testing of the constructive-material system binomial. The attention was directed towards the modular system development which allowed a higher level in adaptability and repetition, similar to the biological structures. The natural base element which inspired the project was a flat body echinoderms skeletal shell that in the design process helped shaping a polygonal board's modular system, using finger-joints. Unlike other lighter traditional structures this type of design system can be applied to a various range of geometries and spatial structures. In the digital design process a number of biological structures specifically characteristics are applied, such as: heterogeneity; anisotropy and hierarchy.

In the complex morphology design and execution, specific to parametric structures, a closed informational loop between the project design, completed elements simulation and the computerized numerical verification, is created. The structural design and the formal expression establishing are closely interconnected (fig. 4).

The functionalist modernism dictum *form follows function* does not apply to the current practice. Parametric design is primarily based on the development of new structural-constructive techniques and on the design morphology system. Thus the formal-esthetic researches pass in the background.

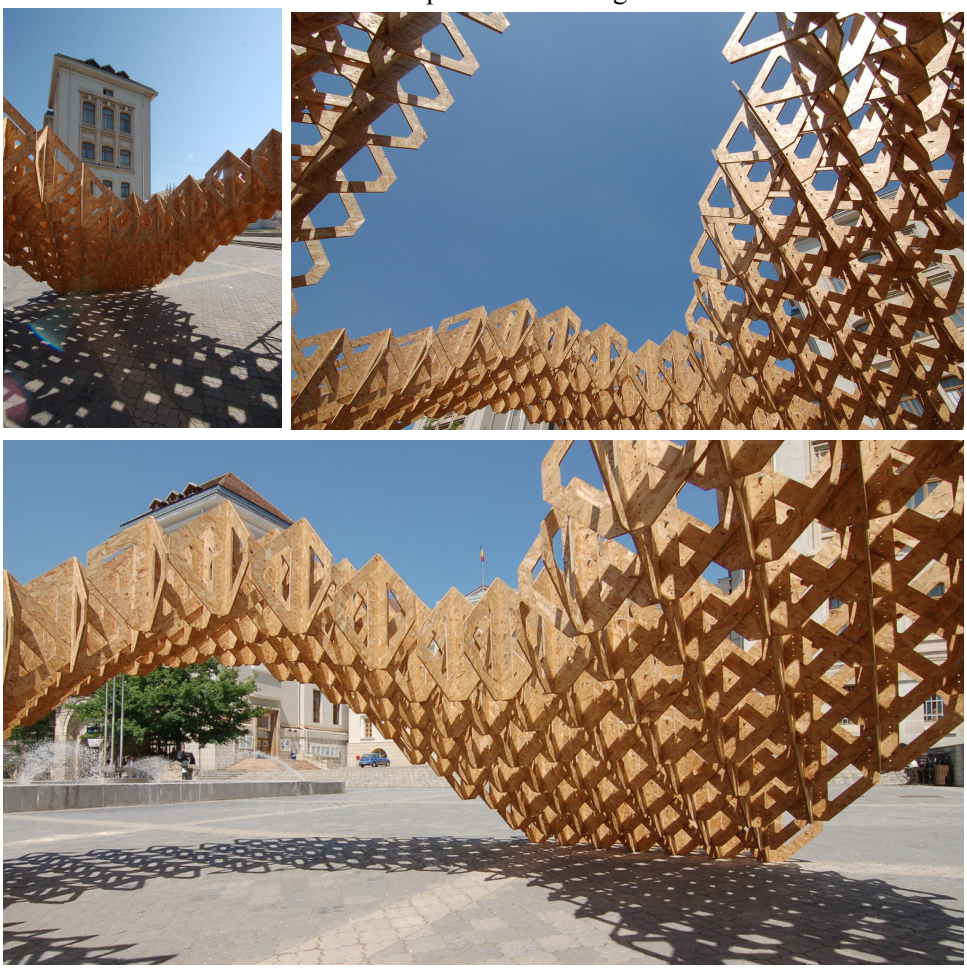

Fig.4 - Parametric structure,Iasi, Romania, 2012, authors: ASAI – Asociatia studeților arhitecți din Iaşi, Photo credits: © Răzvan Nica

The nature and the implications of the parametric design can not be fully highlighted without these concerns being incorporated in the contemporary technological phenomena. *The question regarding the technique* addressed by Martin Heidegger is deeply related to the present, as the design process can not occur without a symbiotic relation with the modern science. Contemporary science is no longer a tool in designing and construction, but becomes a human-built space mediator. In this field, the technology varies between the status of means and *purpose*. Martin Heidegger makes a phenomenological analysis based on the return to the *object itself* and on the denial of the preconceived labels and guides through which the man distance him self from his own

existence essence. He makes a clarification in the difference between the *meaning* and the *essence* of the technique, based on the fact that the essence of the technique is not related to the technical field. The essence of the technique can not be understood through a technical language, but only through a simultaneously and obviously related, the art field.

For the essence discovery, a complete definition of the technique is preliminary necessary. From the anthropological and the instrumental point of view definition portraits the technique as a mean used for different purposes and as a human activity. The two integrant parts (*mean* and *activity*) form an inseparable whole, through which the technique is shown as an ordering method for the built and the usage of tools and machines on one way and on the other way the needs and purposes they meet. The issue is of the man's ability to *master it spiritually* and to prevail over the modern technique. Thus the parametric design must be mastered in such a way that in can become, in the design process, a *mean* for the context conditionings integration and for the beneficiary's multiple requirements. The parametric design is, yet, in an early stage and the structures thus resulted are, often, limited to the *purpose* stage (fig. 4).

CONCLUSIONS

1. The parametric design can embody, in the development process a more extensive informational content than it is usually possible: the various conditioning created by the physical and social context become parameters and determining factors in the final shape of the structure. Parametric structures have the ability to give an alternative, as a constructive system and even in finishing elements, for architecture and landscaping design and can be a redefining opportunity for an anonymous public space.

2.The use of parametric design in the landscape design does not aims to satisfy a concrete function, but a challenge for the viewers imagination and the marking of a playful and unpredictable pause in the gardens and parks urban landscape.

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