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ALGORITHMIC THINKING

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Algorithmic Thinking

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The 8th issue of the **archiDOCT** e-journal gathers papers that explore the idea of relational thinking in architectural design. The main aim of the issue is to highlight doctoral research work that deals with design processes of open-ended scenarios where information technology plays a key role. Nowadays there seems to be a consensus about the current issues recurring in design: continuous variation and intelligent emergence towards variability that is explored through computation. The variability yielded through the exploitation of computation allows for new design methodologies to emerge that in turn suggest new formal languages. In this sense the current architectural narrations assert for a dynamic conception of form. The notion of architectural form as interface, emerges as a crucial factor for design appling a real-time affection between architecture and people. Architectural design proposals are driven by a better consciousness of material behavioural possibilities aiming for formal enrichment. Architects might be looking at systems components and their interactions with each other in an attempt to find the basic definition of a new aesthetics. The integration of smart materials and the emergence of the constitutive automation model is important in this direction, as it leads to research that simplify control systems while augmenting form dynamics.

This time we have had the chance, the honour and the fortune to count on the text written by **Kostas Terzidis**, "The Intricacy of the Otherness". Kostas Terzidis, author of the book "Algorithmic Architecture", is a pioneer and a world-wide recognized expert on these subjects. In that book he coined the term algotecture to denote the use of algorithms in architecture. We are sure this text will give a new point of view to all the readers interested in **Algorithmic Thinking**, as well as to the contributors to this issue.

This **archiDOCT** issue shows doctoral research efforts focusing upon New Digital approaches system finding based, that have opened up the debate on a new aesthetics associated with the second phase of digital era we are currently experiencing. Authors are not only engaged with concepts as variability, parametric design, digital media, algorithmic design, continuity or digital materialization and fabrication techniques but also with concepts within the post-parametrics era and the definition of the respective discourse. Contemporary advances in systems based on the continuous variation triggered by the intelligence of their components interacting with each other, are currently proposed as the cause for the emergent properties that will configure architectural design.

In this direction, **Enrique Soriano**, PhD student at Barcelona Tech, UPC, explores and deepens into the field of gridshells in his text "Low-tech Geodesic Gridshell: Almond Pavilion". He believes that traditional gridhsells are extremely efficient but the erection complexity make them neither appealing for the industry nor accesible. This paper shows the research conducted on the universalization of the alternative irregular gridshells based on geodesic patterns, that enabled to build . The paper discusses the suitability for scarce budgets and low-tech manufacturing. Geodesic gridshells are defined and a low-tech implementation of a multilayered geodesic gridshell is presented.

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In a very different way, **Omar Avellaneda**, PhD student at Barcelona Tech, UPC, in his text "Deployable Structures System, Hexagonal X-frame - Three Case Studies", reproduces part of his research about methods to control the movement of the deployable structures with membranes. Using maximum stresses of this textile he tries to stabilize and control the movement of the deployable structures. The research proposes three case studies, from its geometrical design to the final realization of a low cost scale prototype. Supported by parametric design and physical models, he verifies the movement and geometry finally proposing to create support tools for the design of deployable x-frame structures with hexagonal modules.

Angelo Figliola, PhD student at La Sapienza (Rome), in his text "Post-industrial Robotics: The New Tendency of Digital Fabrication for Exploring Responsive Forms and Materials Through Performance" shows his research on robotics manufacturing issues on a 1:1 scale. The pavilions Fusta Robotics and Digital Urban Orchard and the technological system In. Flux are the results of tests in which material, environmental and structural performance inform the computational process and the consequent materialization. Fusta Robotics is the result of collaboration between industry and universities for the tectonic experimentation derived from the use of local non-engineered material. Digital Urban Orchard is the formal expression of a complex functional program arising from the relationship amongst form, function and context for a new concept of socialization space and food production within the agenda at the self-sufficiency in Barcelona. Finally, through the In.Flux prototype, he investigates the relationship among formal generation, structural analysis and robotic manufacturing for the realization of concrete free-form structures opening the debate on the role of IT in the post-digital era when the design process manifests through the control and management of the flow of information affecting the digital computation and fabrication and the material behaviour.

Another approach to the subject is presented by **Katerina Saraptzian**, PhD student at AUTH (Aristotle University of Thessaloniki). In her paper "Integrated Evolutionary Strategies on Structurally Informed Complex Grid Morphologies" presents an on-going research, which addresses the notion of algorithmic thinking in architectural design that can re-create efficient integrated design strategies. It focuses, in particular, on the notion of structural complexity and attempts to interpret it as a 'bottom-up' property that can inspire and facilitate the design of non-standard forms in architecture. Her experimental approach attempts to investigate a series of parameters that can dynamically affect the form-finding procedure of an irregular grid system and aims to generate evolutionary strategies on structurally informed complex morphologies. Those parameters are examined through their combination on a set of digital simulations, while the whole process is being computationally encoded and performed within the environment of Grasshopper.

Finally, **Natalia Torres**, PhD student at Barcelona Tech, UPC, in her paper "Deployable Arches Based on Regular Polygon Geometry" discusses a deployable-arch-structure design that is built using articulated bars, commonly called as scissor-system, based on regular polygon geometry. Deployable structures elude the need for these external supports greatly simplifying the assembly process and deployment time. In a point of her conclusions she says "parametric design has generated valuable solutions to the geometric concept, which results in more efficient design, manufacturing, and assembly. In addition, a new way to design deployable structures through variable geometric parameters has been developed".

Cover Image credits: Ana Cocho-Bermejo. *Proccesing studies for the 9 cubes problem*