Editorial

We are witnessing a rethinking of process as architectural design and construction shift focus toward parametric relationships that address geometry, tectonics, materiality, space, and context. To support this shift, architects are increasingly using parametric modeling and end-user programming. Such tools enable explicit expression of design intentions that span the entire design process, from conception to construction.

Further, by deferral of decisions such as precise location and even the contextually-dependent existence of parts, the new design processes have opened the potential to explore a realm of possibilities rather than accept a single solution. Clients experience these new processes through evolution of the designs produced and greater involvement in decision-making as design proceeds. Constructors face higher levels of customization and increasingly sophisticated means of communicating construction intent. This issue of IJAC contains a selection of papers that investigate the above issues focusing primarily on the parametric aspects of architecture.

One of the earliest computational methods of expressing design intention – and one that predates computerized implementations – is that of Shape Grammars. As pioneered by George Stiny and others, shape grammars allow one to define a visual and spatial vocabulary, a set of operational rules, and a definition of states of one's design. This powerful methodology for expressing design thinking has influenced many researchers who have used Shape Grammars to analyze existing buildings and styles by deriving their vocabulary and rules of construction and invent new instantiations of that style based on a parametric re-application of the rules.

The first paper, by Suzana Said and Mohamed Embi, describes 'A Parametric Shape Grammar of the Traditional Malay Long-Roof Type Houses.' Their analysis is both thorough and methodic and illustrates the potential and role of Shape Grammars in an overall parametric approach to architectural design. Their foray into deploying their system in computerized form is commendable, as the Shape Grammars are notoriously difficult to computerize.

The second paper, by Hyoung-June Park, titled 'Parametric Variations of Palladio's Villa Rotonda,' is a good progression from the preceding paper. It focuses on an architectural style that was analyzed using one the earliest Shape Grammars, but takes a different approach. Specifically, the author uses genetic algorithms to apply morphological transformations on the villa while applying a fitness function to seek an optimal set of proportionalities. Not surprisingly, the author's mathematical analysis confirms that Palladio's treatment of proportional balance in the Villa Rotonda is exquisite.

The third paper by Yaniv Ophir, titled 'Parametric Program Modeling: Using Particle Flow as a Tool for Exploring Programmatic Organization in High-Rise Buildings,' deploys a time-based computational tool (particle flow)

not as a form-finding method as used by many others, but as a means for exploring and optimizing the spatial internal organization of an architectural program. Ophir offers the use of advanced computational tools as a method to increase the spatial 'complexity' of tall buildings to counter current design cultures. In addition, the author argues for a reversal of current 'formal' methods that use computational tools to derive an external skin that then gets filled with program. Instead, he deploys particle flows to generate a spatial program that he then proposes several ways of 'skinning'. The author argues that this approach better ensures that spatial complexity and relationships are maintained.

The fourth and last paper of this issue, by Arno Schlueter and Tobias Bonwetsch, is titled 'Design Rationalization of Irregular Cellular Structures.' This paper, not unlike others in this collection, concentrates on the issue of optimization and rationalization. In this case, however, the analysis of a pre-existing cellular structure design is optimized to reduce production effort. The authors offer the interesting argument that a conceptual and visual metaphor is key to an optimization and rationalization strategy. They aim to empower architects and designers by allowing them to 'pre-rationalize' their designs before transferring it to engineers; thus helping to maintain the integrity of the original design concept.

In conclusion, this small collection of papers clearly illustrates that parametric computational methods are powerful implements for many aspects of the design and construction process. They can be deployed in the early stages as design-space exploration tools and in design development as optimization and rationalization tools. Additionally, the papers demonstrate the efficacy of these tools in the analysis of spatial organization, environmental factors, material and structural analysis and even more esoteric concepts such as complexity and aesthetics in architecture. These papers and others published elsewhere reveal that the parametric approach to design has transcended quantitative analyses to make possible a qualitative consideration of architecture, an aspect that computer-aided design has long sought. We hope you will enjoy reading this issue as we have.

Senior editors
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