

Algorithmic Paradigm for Design Innovation in Architecture

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Digital-driven architecture has been raising new design possibilities. Advances in CAD/CAM technologies are radically changing the way of designing, constructing buildings and narrowing the gap between what can be designed, and what can be built. Among various types of digital architecture, an innovative approach is highlighted recently: algorithmic design. An algorithm is a procedure that receives data as input, processes them and returns a solution to a question. Algorithmic design is the process of creating design solution by utilization of mathematics and rule-based logic. It is not the exclusive possession of computer science anymore. It can generate various options with parameter(s) that designers define, evaluate quantitatively design elements such as geometrical form, performance aspects and others. The output inspires human mind to develop and expand design possibility beyond the predictable events. Computation within algorithmic is not just a design tool for virtual representation of one's design idea but rather design process in that it can offer the methods of exploration and experimentation.

This keynote presentation will show the several case studies to illustrate how we can utilize the algorithmic design in both conceptual and practical levels. The first is to investigate using a Cellular Automata (CA) as a generative design strategy that creates a design framework for a contemporary Han-ok, the traditional Korean house. The second case introduces the process for Multi-objective Optimization Framework (MOF), which mediates multiple conflicting design targets by using Genetic algorithms, followed by the practical application to the façade design of a Recreation Center and a library at the University of Lima, Peru. The last two fabrication examples including the art wall installation in house and concrete shading screen will demonstrate how we can translate the virtual output of the algorithmic design into the tangible objects.

Lastly, we will discuss how to frame the pedagogical approach in order to foster students with the comprehensive knowledge encompassing computation intelligence and design sensibility to prepare for this paradigm shift.