

GENERATIVE ALGORITHMIC TECHNIQUES FOR ARCHITECTURAL DESIGN

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Architectural design methodology is expanded through the ability to create bespoke computational methods as integrated parts of the design process. The rapid proliferation of digital production techniques within building industry provides new means for establishing seamless flows between digital form-generation and the realisation process. A tendency in recent practice shows an increased focus on developing unique tectonic solutions as a crucial ingredient in the design solution. These converging trajectories form the contextual basis for this thesis.

In architectural design, digital tools have predominantly been used for representation and specification, and as an efficient replacement of equivalent manual tools. Recent developments allow architects to integrate computation in the design process. Thus, computation is used for generating geometry and information concerning realisation. In this situation, the architect's attention is directed towards the form-generating rules, which then reflect design intents, contextual parameters and production constraints. An advantage of this approach is the capability of managing substantial complexity in terms of geometry and performance. This is partly due to the fact that underlying mathematical logic allows information to be generated on many levels with respect to development stages and the needs of the receiver.

A necessity for establishing an architectural framework for adopting and discussing generative techniques is addressed in this research. As such, a series of methods directed towards specific types of geometric and architectural problems is developed, and form the basis for discussing the potentials and implications related to each problem type. These methods are often inspired by models developed within natural sciences, biology in



particular. The principles are further developed to form new modes of articulation in architectural design. Certain methods are contributions, which suggest a potential for future use and development. Thus, a method is directed towards bottom-up generation of surface topology through the use of an agent-based logic. Another method embeds a negotiation between pattern-formation and contextual parameters in the form-generating process. A third example demonstrates a flow of information and matter from form-generation to realisation through the use of generative tools and feedback loops in the design development. Three additional methods are described, and reference examples help to establish an overall discussion across the algorithmic and architectonic principles. Here, potentials and implications for architectural design are discussed. Both concerning a method oriented level, where different approaches are compared, and a general perspective with respect to architectural design methodology.

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