A NOTE ON THE CONCEPTUAL BASIS OF DESIGNS

SOTIRIOS D. KOTSOPULOS
Massachusetts Institute of Technology
skots@alum.mit.edu

1. Problem

CAD systems have a strong influence on design theory and practice. But even though they were widely used in the process of design representation or execution, their acceptance as an aid in the creative process remains poor. Beginning from this problem the paper outlines a design framework with broader aim the use of computation in the studio.

2. Proposal

In the absence of universal pre-organizing design principles, architects base their search on their own hypotheses and techniques. Like the craftsmen, they depend on personal working manners that have been proved effective in the past. They begin from general views for a given problem and gradually develop ways to achieve specific results. This evolution from something open ended to something specific is analogous to moving from general principles or habits to specific rules and their parameters. Within a formal system, this is similar to moving from general axiom schemata to rules. A formal account of the action of axiom schemata within symbolic systems can be found in Church 1956. A formal account of their action in spatial systems exists in Stiny 1980, 2000. Applications of spatial rule systems in the analysis of designs can be found on papers describing Japanese tea-room designs (Knight 1981), Queen Ann houses (Flemming 1987), Taiwanese houses (Chiou and Krishnamurti 1995), Yingzao fashi houses (Li 2000), and more. Applications in designing from scratch exist in Kotsopoulos 2005.

A rule schema \( g(x) \rightarrow g(y) \) represents infinite rules by an expression containing variables \( x, y \) and a predicate \( g \) indicating the attributes of \( x, y \). For example \( g: \) “\( x, y \) are parametric prisms”. The next example shows the
derivation of a possible conceptual schema for an office building, proposed by Boston architect Kiki Belle: The general design decision of placing one “building entity” within another is depicted abstractly by a rule schema.

Rule schema:

Sample derivation:

Figure 1. Parametric versions of a single rule schema produce a conceptual design schema.

In the studio, designers begin from analysis of the building program. But the articulation of any working hypothesis (or design concept) cannot be produced by simple analysis of the provided information. It requires judgment and synthesis. In the process of implementation, architects test their hypotheses against existing standards and conventions. The design hypothesis links the independent nodes of the search by providing a central theme for the design. It organizes priorities, and reveals possible conflicts.

Figure 4. Implementation requires the interaction of many diverse specialized domains.

In the studio, designers practice their ability to “diagnose” problems, and to make productive hypotheses. It is by the means of these hypotheses that designers interpret and organize existing descriptions in novel ways. Architects invent general rule schemata implied in terms of them, and interpretations for the emerging network of their relationships. Then, they test them against the existing building codes and standards. In implementation, a hypothesis permits the evaluation of specific decisions as part of a more general conceptual framework.
References


Flemming, U.: 1967, More than the sum of parts: the grammar of Queen Anne houses, Environment and Planning B: Planning and Design, 14, pp. 323-350


