Entelechy I

Towards a Formal Specification of John Portman's Domestic Architecture

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John Portman's work attracts much interest, although little scholarship exists that directly engages his contribution in formal composition. Most of the discussion of Portman's architecture tends to focus on his commercial work and hotels, although a key to understanding his work is found in his personal domestic projects where he has had the freedom to explore his architectural ideas. This study focuses on his first residence, Entelechy I, to begin outlining his design principles formally. The ambition is to open up the whole question of his architectural contribution in the United States and at large.

Keywords: Shape grammars, Formal composition, John Portman

INTRODUCTION

John Portman’s architecture is perplexing. His work is simultaneously pragmatic and dazzling, attracting both critique and admiration. His unconventional vision of the hybrid architect-developer that obliterates the opposition between client and architect, and his prolific output that reformed Atlanta’s downtown skyline with new urban typologies and megastuctures (exported since all over the world), have both contributed to an architectural legacy that continues to invite critical assessment (Riani, Goldberger and Portman, 1990; Koolhaas, 1998). The importance of Portman's first house, Entelechy I, is emphasized by the fact that he himself speaks of the house as critical to his own architectural development. In his 1976 book, The Architect as Developer, he states that the house "contains the basis for my architectural philosophy" (Portman and Barnett, 1976). Completed in 1964 at the beginning of his career, the house was a testing ground for Portman’s emerging architectural philosophies supported by the success of his initial development venture that created Atlanta’s Merchandise Mart in 1961. Today, the home is still the architects’ primary residence and he maintains its critical role in his formal evolution. The work presented here outlines an initial effort to examine the house as a means to establish a framework for a larger consideration of Portman’s formal contributions in architectural composition. The work is organized in two parts: part one describes the formal qualities of the house and part two outlines a generative description. The final discussion reflects on how the findings contribute to studies in formal composition in general and in particular to John Portman’s work.

FORMAL DESCRIPTION

The origin of the term ‘entelechy’ can be found in Aristotle from the Greek ἐντελέχεια (Latin entelecheia), which describes something becoming out of its inherent potential. This philosophical origin
Figure 1
Floor Plans. Top: upper floor plan (main entry level); Bottom: lower floor plan; Legend: 1. entry foyer, 2. living room, 3. music room, 4. dining room, 5. kitchen, 6. family dining room, 7. family/play room, 8. master bedroom, 9. master bathroom, 10. master study, 11. bedroom, 12. staff bedroom, 13. laundry/utility area.
inspired the name for Entelechy I, Portman’s first house designed as a pavilion for him and his family to live their daily lives in as well as entertain in. The primary idea of the house is Portman’s concept of “space within space” that echoes his desire to emulate the order and variety of nature. This conception of nested space appears in the composition of the house in two layers: first, a hierarchical zoning of functions based on use, and second in the articulation of modules defining two types of space in a consistent rhythm throughout the structure. The order of both of these organizations is contrasted by planar and sectional complexities that create variety within these definitions.

Spatial hierarchies in the house are clearly divided to support two zones of use and separate their functions (Figures 1 and 2). The first zone is the private family area, vertically maintained on both levels of the house, which includes bedrooms, bathrooms, the kitchen, family living and dining rooms, as well as support spaces. The second zone is the public entertaining area of the house that includes the entry, dining room, two living rooms and the music room. All of the spaces on the public entertaining side of the house are double-height except for the floating dining room and entry foyer above that occur in the main axis of the house. Along this axis, a water channel also flows through the house to clearly demarcate the two zones. To reinforce connections within these zones, three circulation staircases serve these areas, one for private family use, one exclusive to the master suite on the family side, and one public stair connecting the entry foyer to the entertaining zone of the house. This clear zoning allows the house to operate as a place for welcoming guests while simultaneously preserving privacy for the family.

The house relies on two modules of space ordered throughout the house by the exploded columns that structurally support it. A grid of these exploded columns sets a consistent spatial rhythm of two types of spaces within the entire pavilion, labeled here as major and minor spaces (Figure 3). The eight-paneled exploded column defines a major space while simultaneously containing minor spaces. Of the exploded column’s eight panels, the four on the cardinal axes of the house are consistently fixed as structure and the other four are flexible for arrangement as desired. The columns are used to structure a variety of spaces (studies, closets, libraries, half bathrooms, spaces to house staircases connecting levels, and art alcoves) as well as to provide natural light from circular skylights where the columns meet the roof.
Spatial variety is developed in both minor and major spaces. Minor spaces open up horizontally through the floors to function as continuous skylights and stairwells in the house. Major spaces concatenate along both horizontal and vertical planes. Horizontally, they group to form larger rooms that function as gathering spaces and access halls since the house contains no corridors. Vertically, they combine as double-height spaces to welcome guests on the entertaining side of the house. The resulting compositional system of the house is relatively simple, but relies on these three-dimensional relationships across levels that introduce variety to this fixed order.

**GENERATIVE DESCRIPTION**

This work proposes a parametric shape grammar that interprets the formal composition of Entelechy I. The grammar aims to capture the basis of the "organizing principles" Portman identifies with the house and claims have pervaded his architecture ever since. The grammar is then capable of producing playful variations of Portman's domestic architecture at a variety of scales that conform to the logic ordered by the grammar. As summarized in the previous section, the formal relationships in the house work across both horizontal and vertical planes. This requires the grammar to work in a variety of modes to operate three-dimensionally.

To resolve this in the grammar, the primary vocabulary element is defined as a major space that sets up a framework for ordering the functional zones and introducing the exploded columns that define the minor spaces throughout the house (Figure 4). This element is an entirely three-dimensional spatial module but it is abstracted for representational simplicity in the grammar. Just as designers draw in two-dimensions while thinking through three, the grammar aims to suggest embedded three-dimensional spatial relationships within each of these flat representations. Rules are expressed by a two-dimensional "top" or plan view and utilize level (L) conditions that define the application of the rule to coordinate the three-dimensional implications (Figure 5). Productions at the end of each stage of the grammar include the two-dimensional results of the application of a series of rules for all levels (Figure 6). This illustrates how a rule is applied over multiple levels for any production. These conventions aim to map the three-dimensionality embedded in the grammar to its two-dimensional representation.

The grammar is divided into stages that incrementally work through the design from basic concepts to developed articulation in a manner analogous to processes in architectural design. In all, the grammar is comprised of four stages to order the compositional logic of Entelechy I:

- Stage 1: Framework
- Stage 2: Basic Configuration
- Stage 3: Details
- Stage 4: Termination

The rules of Stage 2 are shown in Figure 5.

The first stage initiates the grammar by establishing the framework for the generation, defining a three-dimensional lattice setting the scope for the design. The lattice is organized to accommodate all floors of the design and begins with the cross-axis that separates the two functional zones of the house. The second stage works through the main spatial features within and across levels to arrive at a basic configuration articulating the various types of spaces in
the house. In this stage, structural columns are added to define the major and minor spaces regulated by the lattice established in the first stage. Additionally, spaces concatenate horizontally and vertically to establish the major volumes (Figures 5 and 6). The third stage develops the interior and exterior details of the design to create a complete design. Finally, the fourth stage cleans up any remaining labels and terminates the process.

These four stages applied recursively generate the design of Entelechy I at a minimum, but this generous formalism is also capable of producing multiple designs based on the principles captured in the grammar. These speculative constructs suggest the possibilities within this parsing of Portman’s system.

To illustrate this potential, three designs generated from the grammar are shown as imaginative alternatives. The constructs are distinguished by their names: Entelechy S, M, and L, with the assumption that Entelechy I is equivalent to the Entelechy L from which the others are scaled. As shown in Figure 7, these generations range from a simple pavilion (Entelechy S) to a modest house (Entelechy M), and finally, to a villa matching the original (Entelechy L). This variation and cellular scalability suggest the versatility of Portman’s system to accommodate multiple domestic configurations, programs, and sites.
The final designs are shown as plans but they are actually intended to represent cuts of a fully three-dimensional model generated by the grammar. To illustrate this embedded three-dimensionality of the grammar within a generated design, a final exploded axonometric view of the whole composition is provided at the end of the grammar to illustrate the full articulation of the rules (Figure 8). This image captures the design as if the plans are suddenly stacked and rotated within the flexibility of an interactive CAD application to show more of what is actually represented in the two-dimensional drawing. These conventions aim to map the three-dimensionality embedded in the grammar to its abstracted two-dimensional representation.

**DISCUSSION**

Interpreting an architectural language is a layered process. The two parts outlined in this work aim to open up a discussion of contemporary efforts in formal composition in general and specifically pertaining to the work of John Portman. Formal and generative descriptions allow us to view the work within a specific interpretive lens and create from any iden-
tified principles. Shape grammars provide the foundation of a generative formalism that can be generously applied under a variety of conventions for productive results (Stiny and Mitchell, 1978; Koning and Eizenberg, 1981; Duarte, 2005). Taking that one step further in an extension of the studies outlined here, an active description is capable of explicitly capturing the principles embedded in this type of formal and generative study. Real-time automation allows implementations of shape grammars to be considered as active software that can aid design processes. This will allow the grammar to be interactively engaged by a designer to follow the grammar, understand its conventions, and produce new variations of Portman’s domestic architecture based on the relationships in the shape rules. This type of ac-

Figure 8
The design of Entelechy L (or Entelechy I) generated by the grammar, shown in its three-dimensional representation.
tive grammar is then testable, provable, and potentially applicable to other contexts. Given this next step in the work, the grammar will lead a designer through the generation of additional designs based on the language while also allowing back and forth movement between rules to understand their explicit implications. Within this setup, rules can also be modified and applied to other conditions based on a designer’s intuition combined with the logic of the grammar. This compliments a body of research on computer implementations of shape grammars (Grasl and Economou, 2011) and suggests their potential as active design tools extending efforts in formal composition to their next level of productive representation.

John Portman’s contribution in architectural composition has rarely been engaged and this work aims to begin unpacking his compositional logic in a constructive way. Entelechy I establishes a system for a house that is highly ordered but also flexible for change and creative modification over time. The functions of the house are thoughtfully separated to support a versatile family and social life. The expansive exploded columns transform structure into inventive, naturally-lit support spaces allowing the rest of the house to breathe. This reinterpretation and extension of the column as an exploded spatial element embodied in Portman’s concept of “space within space” is a critical schema of Portman’s work.

Portman’s identification of the house as a marker of his own architectural philosophy with “organizing principles that work for a room or a restaurant, a building or a group of buildings” (Portman and Barnett, 1976) invites a larger study of the house against the greater corpus of his work to interpret their relationships. To truly engage this greater context of Portman’s formal contribution, additional projects must be considered to study a larger compositional pattern expanding on this effort. In shape computation discourse, alternate contexts can be described as shapes (Stiny, 2006). The visual nature of shape rules relates directly to a design composition, but rule schemata are a more general summary of the conceptual action represented in the rule. Recent recasting of shape rules and rule schemata has pointed to a more generous approach to design formalism that can lend itself to this discussion. Historically, rule schemata were shape-specific and tied to that definition. Today, it is suggested that shape schema can be represented by any parametric shape to exercise the schema (Economou and Kotsopoulos, 2014). If Portman himself claims that all his design principles are inherent in Entelechy I, are there schemas that can be defined through this study that are applied in other contexts (shapes) in the rest of his works?

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