Utilizing Architectural Diagrams to Create Geometric Forms that Anticipate User Responses

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I. EXTENDED ABSTRACT

I.1. Introduction

The Diagram is an architectural design tool that operates between conceptual ideas and resultant geometry, between design intent and a building's shape. What if we could harness the power of diagramming to make a building appeal directly to human neurological processing? By inserting an honest exploration of diagram to control geometric forms via analysis of program, circulation, context, and environment, we can potentially organize architectural geometry to more effectively coordinate with expected human responses, our collective visual memories, and cognitive mapping. By the agency of contextual learning, a building's users should be able to determine their route and occupation of a space without the need to have a floorplan or view copious signage. Many architects have been experimenting with this technique without specifically identifying the neurological research implications.

In Peter Eisenman's book Diagram Diaries, theorist Robert Somol explains the unique character of what defines a diagram: "it appears in the first instance to operate precisely between form and word," and it is primarily "a performative rather than a representational device." To understand the potential of utilizing diagrams to create responsive forms, we can assess the classification, characteristics, and the evaluation criteria of their application. We can also evaluate both the historical utilization of this architectural technique and its implementation in more recent examples.

I.2. Classification

I. Analysis. Analytical diagrams are frequently created post-construction or post-concept, to either compare or explain the spatial qualities of a particular piece of architecture. Typically, these types of diagrams are in search of patterns to reveal spatial divisions or some other spatial device such as phenomenal transparency. This is primarily a mathematical exercise, evaluating standard architectural elements: column, floor, wall, and roof. Colin Rowe was a frequenter of this type of diagram, and Peter Eisenman employed a series of analytical diagrams when generating his house plans during the earlier part of his career.

2. Performance. Of greater concern to neurological research, diagrams should indicate building performance. Typically, a performance based diagram is considered during the conceptual design phase, and, optimistically, before notions of form and typology are generated. Performative diagrams can be characterized by their adherence to three main attributes:

2a. Operation. These diagrams concern the exhibition of programmatic relationships, environmental concerns (daylight, ventilation, solar gain, etc.), and circulation (pedestrian, vehicular, entry, etc.). Contemporary diagrams frequently consider zoning issues, adjacent context, views, and site features.

2b. Geometry. These are the forces that may influence a building's shape: the plasticity of form absent of meaning. This includes geometric manipulations such as: "expand, extrude, inflate, branch, merge, nest, offset, bend, and skew." Architects frequently employ arrows to indicate which geometric forces are employed.

2c. Translation. It is important for the investigation of the operative intent to inform the geometry of the building. One of the major distinctions of what defines a diagram is that it is essentially a drawing in search of a relationship between geometry and some outside force, what Eisenman calls an "external agent." This is the attribute most important for studying human neurological interpretation for architectural practice, where there is a literal connection between the diagrammatic ideas and the form.

I.3. Characteristics

Simplification. The simplification of the diagram is an essential step. Without it, the complexities of the diagrams begin to elicit too many intentions and interpretations. **Hierarchy.** The strategic determination of the sequence in which forces operate on the geometric form. **Drawing Type.** Diagrams may be plan, section, axonometric, or perspective; orthogonal or curvilinear; hard-lined or freehand. They can be singular, simultaneous, or sequential. **Spatial Elements.** Meaning can be injected into geometry via landmarks, pathways, nodes, volumes, areas, edges, and architectural elements.

I.4. Evaluation Criteria

Relevant Scale. The direct relationship between the scale of the investigation and the scale of the architecture within such a building. **Symbolism.** The correlation between a symbolic reference and a building's shape. **Plasticity.** A truly plastic design technique would ignore existing tectonics and typologies. Standard architectural elements: column, wall, floor, can be reduced to their core functions, which might be: gravity displacer, space divider, and gravity positioner, respectively. **Behavior.** Designing for a particular behavioral response. **Transparency and Legibility.** Revealing the diagram experientially within a building to effectively communicate an intended response by a user. **Gestalt.** The visual expectations of humans to form impressions via how the architecture is organized and expressed. **Cognitive.** Human tendencies for comfort and security.

I.5. Historical Examples

Panopticon. A simple and reductive idea: a central guard can view all cells of a prison simultaneously. **Guggenheim New York.** Wright developed a continuous loop for exhibition with an honest investigation into the conduct of a museum visitor. **Carpenter Center.** The centralized promenade is designed so that there is a gradual revealing of the programmatic pieces within the building.

I.6. Contemporary Examples

The Broad. The Architects' investigative procedure involved a direct correlation between their concept: the "veil and the vault," and the programmatic requirements: the display and the storage of artwork. **The Spiral at Hudson Yards.** Extending the adjacent High Line Park into the construction of the tower, every floor has an outdoor terrace with park-like qualities. An office tenant may intuitively feel connected to the adjacent office floors and the High Line below. **The Couch.** Compiling programmatic needs can create legible forms for user groups. This project elucidates how buildings can be more acrobatic, simultaneously responding to multiple influences at one moment via versatile geometry.

I.7. Author's Research Projects

Frogtown Riverside Center. An investigation into a site's most prominent feature, a recreation path, yields a curvilinear multi-story geometry accommodating multiple user groups. **ONE Archives at USC Libraries.** A programmatic investigation yields distinct interpretable geometries: the archives (solid and closed), an exhibition loop, and modular research and operations spaces.

I.8. Further Research

Testing may determine if average people can passively commit geometric diagrams into their spatial memories for using a building. There are parallel investigations into cognitive mapping and the cortical mechanisms of visual processing that could be mutually beneficial. How can we identify evaluation criteria to determine the success of this architectural technique? Possible studies could include evaluating the experiences of two groups within a building, one of which has been given the circulation or programmatic diagram. Another possibility is to test cognitive mapping by exploring the utility of color and edges to delineate clear zones and circulation paths in existing diagrammatic buildings.

2. REFERENCES

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3. AUTHOR BIO

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