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Space as Dynamic Field Conditions

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Abstract:

While criticizing the current digital design culture in architecture treating space as mere context of architectural form and performance, the research investigates historical theories claiming space as dynamic conditions in relation to diverse spatial experience, filled with dynamic forces and flows. Based on such theories and support by recent scientific experiments, the research tries to reinstate the idea of dynamic space as the focus of digital design culture in architecture, by establishing a system incorporating computational frameworks to investigate properties of dynamic equilibrium in space.

RESEARCH CONTEXT

Since its proliferation in the 1990s, the use of digital technologies in architectural design practices has largely been focused on generation of form: as environmental adaptation to contextual conditions (Lynn 1999) or performative adaptation to material properties and fabrication constrains (Kolarevic and Malkawi 2005). The digital, thus, has moved the discourse within the discipline of architecture away from the notion of space which marked the focal point of discourse for the largest part of the 20th century (Ven 1987).

The idea of space and with it concepts like spatial dynamics can be traced back to discourses in 19th century aesthetics and included abstract notions such as spatial perception, empathy and embodiment, as well as more tangible ideas such as interpenetration of form and space (Mallgrave and Ikonomou 1994). Such range of discourses continued to be reconstructed and facilitated for diverse architectural practices throughout the 20th century (Ven 1987) and the interconnectivity of space and form theorized by adding aspects of phenomenology and spatial perception to the dialogue (Arnheim 1977). Recent studies in neuroscience have confirmed many of this early speculations: the human brain constantly interacts with the external spatial environment in diverse ways with multiple spatial references and cells activated, as well as ideas such as empathy and embodied simulation correspond with innate features of the human brain (Mallgrave 2011; Mallgrave 2013; Robinson and Pallasmaa 2015).

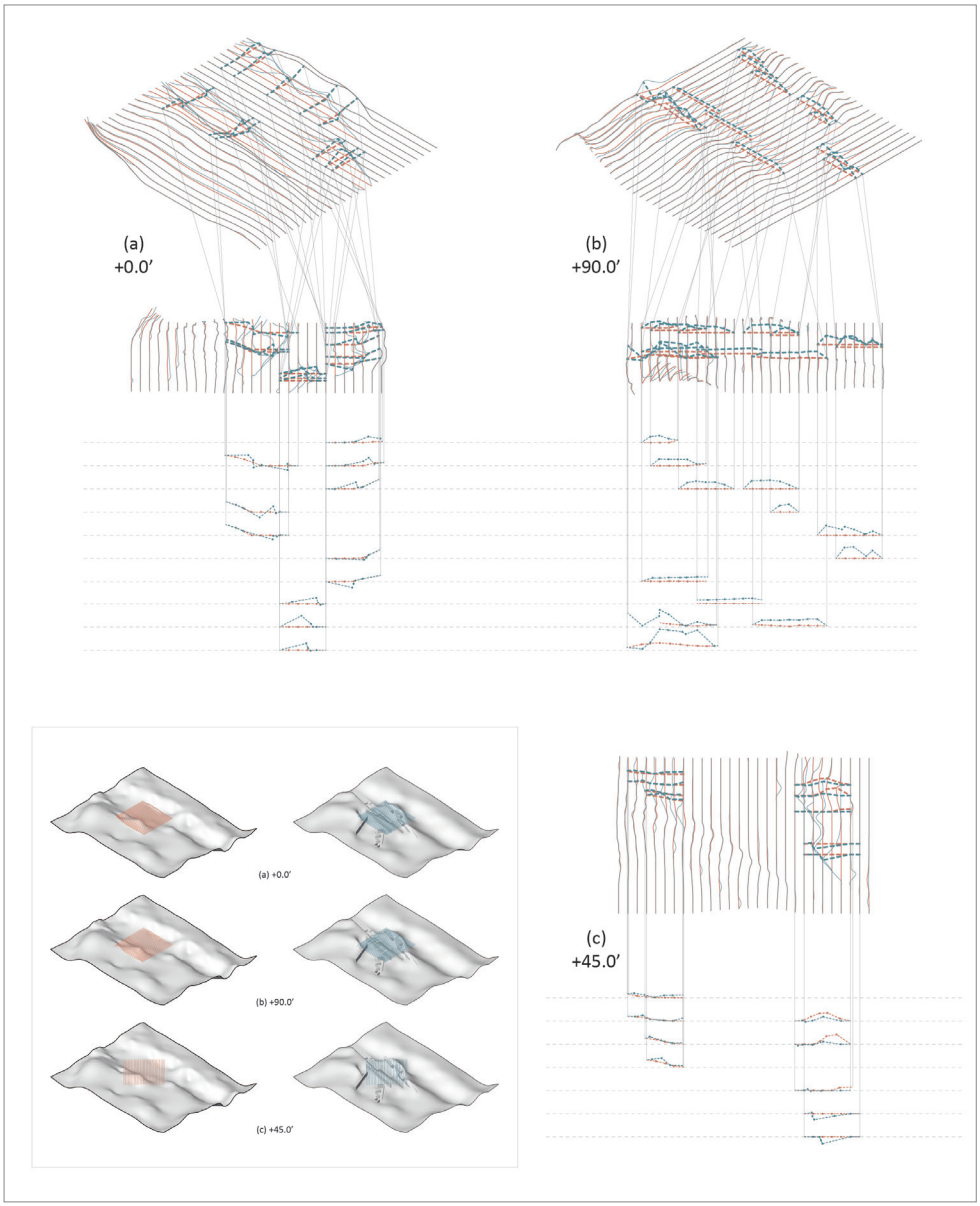
The research attempts to revitalize the notion of space for digital architectural practice based on the interconnectivity of space and form as dynamic interaction of neighboring elements. Such an understanding of space as "field condition" (Allen 2013) has proved to be productive in architectural discourse. The goal of the research is the establishing of spatial dynamics as measurable spatial phenomena, as property of the field condition, and its utilization within a digital framework. Ultimately, this should enable spatial designers to further understanding of spatial dynamics for better practices.

RESEARCH PLAN

The initial stage of the research is to establish a computational framework with a simple field condition composed of particles whose vectors react to network of forces generated by objects in space. The resulting spatial dynamics is visualized by means of a deformation of a laminar flow. The changes in density of the flow, thus, are markers of interaction. The density pattern can vary, depending on the orientation of the laminar flow, the initial density of the field condition, the number of forces involved, intensity and direction of each force, and etc. The constructed laminar functions as a kind of tomography of the spatial conditions and design relevant information can be extracted from an analysis of the correlation of various density patterns. The validity of this tomographic strategy is explored in more depth with a case study on the architecture of Enric Miralles.

The case study is expected to instigate refinement of the framework for a wider range of projects involving varying degrees of complexity and distinctive sets of parameters.

Fig. 1.



References:

Allen, Stan. 2013. "Field Conditions." In *The Digital Turn in Architecture 1992–2012*, edited by Mario Carpo, 62-79. John Wiley & Sons Ltd.

Arnheim, Rudolf. 1977. *The Dynamics of Architectural Form : Based on the 1975 Mary Duke Biddle Lectures at the Cooper Union.* Berkeley, Calif. ; London: University of California Press.

Kolarevic, Branko, and Malkawi, Ali. 2005. *Performative Architecture: Beyond Instrumentality.* London: Routledge

Lynn, Greg. 1999. *Animate Form.* New York: Princeton Architectural Press.

Mallgrave, Harry F. 2013. *Architecture and Embodiment : The Implications of the New Sciences and Humanities for Design.* Routledge.

——. 2011. *The Architect's Brain : Neuroscience, Creativity, and Architecture.* Oxford: Wiley-Blackwell.

Mallgrave, Harry F., and Eleftherios Ikonomou. 1994. *Empathy, Form and Space: Problems in German Aesthetics, 1873-93.* Santa Monica: The Getty Center for the History of Art and the Humanities.

Robinson, Sarah. 2011. *Nesting: Body, Dwelling, Mind.* William Stout Publishers.

Robinson, Sarah, and Juhani Pallasmaa. 2015. *Mind in Architecture: Neuroscience, Embodiment, and the Future of Design.* The MIT Press.

Ven, Cornelis van de. 1987. "Space in architecture : the evolution of a new idea in the theory and history of the modern movements." Assen/Maastricht, The Netherlands, U.S.A.: Wolfeboro, Van Gorcum.