Editorial Paper

From Digital Tools To Contextual Performance: An Editorial Perspective On Parametric Modeling, Environmental Simulation, Affordable Housing, Landscape Design, And Architectural Identity

L.M.F. Purwanto

Editor in Chief, Journal of Digital Architecture
Program Studi Doktor Arsitektur, Konsentrasi Arsitektur Digital, Fakultas Arsitektur dan Desain, Universitas Katolik Soegijapranata

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Digital technology is increasingly transforming architecture from a predominantly representational practice into a process of exploration, simulation, evaluation, and decision-making. The six papers discussed in this editorial—*Interactive 3D Modeling in Grasshopper Using Leap Motion and Firefly: A Case Study of Fingertip-Based Parametric Modeling*, *Digital Analysis of Daylight and Thermal Performance in Residential Architecture of Da Lat*, *Digital Architectural Strategies for Affordable and Climate-Responsive Housing in South Africa*, *Digital Landscape Design as an Extension of Architectural Design: A Contextual Framework for Sustainable Environments in Nepal*, *Critiquing Digital Architecture: Technology, Context, and Architectural Identity*, and *Thermal Comfort Assessment of Boarding Houses in Candisewu, Semarang Using the CBE Thermal Comfort Tool*—collectively demonstrate that digital architecture is no longer concerned only with producing sophisticated forms. Its broader potential lies in connecting design interaction, environmental performance, affordability, landscape, cultural identity, and human comfort.

The first important issue is the changing relationship between designers and computational tools. The use of Grasshopper, Leap Motion, and Firefly for fingertip-based parametric modeling illustrates how architectural modeling can become more interactive and embodied. Instead of relying exclusively on conventional mouse-and-keyboard interfaces, designers can manipulate parameters through physical gestures. This approach potentially makes computational design more intuitive and supports rapid experimentation. However, increased interactivity also produces a large number of design alternatives. Cristie and Joyce emphasize that versioning is essential for parametric design because it supports version control, comparison between iterations, feedback, and design-process analysis [1]. Thus, interactive modeling should not be understood simply as a faster way of generating geometry; it should be integrated with systematic methods for recording, comparing, and evaluating design decisions.

This principle becomes particularly significant when parametric modeling is combined with environmental simulation. The study concerning daylight and thermal performance in residential architecture in Da Lat highlights the importance of evaluating building form in relation to environmental conditions. Previous research has demonstrated that building profiles, offsets, balconies, and orientations can significantly

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influence daylight penetration and indoor thermal conditions [2]. This suggests that digital modeling should move beyond geometric experimentation toward performance-based exploration. A parametric model becomes more valuable when changes in building form can immediately be related to changes in daylight, temperature, ventilation, or energy performance.

The Da Lat case is therefore relevant to a broader transformation in architectural practice. Environmental simulation enables architects to test alternatives before construction and to identify potential problems at an early stage. Nevertheless, simulation should not be treated as an unquestionable source of truth. Results depend on climate data, material assumptions, geometric accuracy, occupancy patterns, and methodological choices. Digital analysis should consequently complement architectural judgment rather than replace it.

The relationship between technology and context becomes even more evident in the discussion of affordable and climate-responsive housing in South Africa. Housing design for low-income communities cannot be evaluated solely through formal innovation or technological sophistication. Windapo *et al.* found that sustainable building technologies in South African low-income housing need to be assessed in relation to their actual use, performance, and socioeconomic sustainability [3]. This finding provides an important warning for digital architecture: a technically advanced solution is not necessarily an appropriate architectural solution.

Digital tools can nevertheless contribute substantially to affordable housing when they are directed toward practical objectives. Parametric systems can help optimize material quantities, test alternative housing configurations, analyze climatic responses, and develop repeatable but adaptable prototypes. The objective should therefore not be to create increasingly complex buildings, but to use computational capabilities to achieve better performance with limited resources.

A similar argument emerges from the relationship between architecture and landscape. The paper on digital landscape design in Nepal points toward an expanded understanding of the architectural design field, in which buildings and landscapes are considered as interconnected systems. Urech *et al.* demonstrate that point-cloud modeling can connect landscape design and planning by providing a shared digital medium for spatial analysis, visualization, transformation, and thermal-comfort assessment [4]. Digital landscape modeling therefore offers more than visual representation: it can support the testing of alternative landscape scenarios and their environmental consequences.

Grêt-Regamey and Fagerholm further argue that effective three-dimensional digital environments should integrate social, ecological, and technical relationships, while also incorporating simulation, participation, local knowledge, and collaboration [5]. This perspective is particularly important for contexts such as Nepal, where landscape decisions cannot be separated from local environmental conditions, cultural practices, and community knowledge. Digital environments should consequently become platforms for collaborative exploration rather than merely sophisticated visualization systems.

However, the increasing power of digital technology also requires critical reflection. The paper *Critiquing Digital Architecture: Technology, Context, and Architectural Identity* raises a fundamental question: can technological progress unintentionally weaken architectural identity? This concern is supported by Hadjadji, Toulan, and Dorra, who discuss the relationship between digital technology, ecological formations, and cultural and architectural identity [6]. Digital technologies can expand formal possibilities,

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but globalized digital practices may also encourage architectural homogenization when local cultural and environmental characteristics are ignored.

Consequently, digital architecture should not be equated with technological novelty. A digitally generated building is not automatically innovative architecture. Innovation becomes meaningful when technology helps architects understand a particular place, respond to its climate, use appropriate resources, and express its cultural context. Digital tools should therefore strengthen contextual design rather than produce generic global forms.

The final dimension addressed by the six papers is human experience. The study of thermal comfort in boarding houses in Candisewu, Semarang, using the CBE Thermal Comfort Tool demonstrates the importance of evaluating buildings from the perspective of their occupants. The CBE tool provides calculations and interactive visualizations based on major thermal-comfort models, including PMV, SET, adaptive comfort, local discomfort, and SolarCal [7]. Such tools enable researchers and architects to translate environmental measurements into indicators that can be related directly to occupant comfort.

This human-centered perspective is essential because architectural performance ultimately concerns people. A building may be geometrically innovative, environmentally optimized, or digitally sophisticated, yet still fail if its occupants experience discomfort. The Candisewu case therefore complements the other five topics by bringing the discussion back to the user.

Taken together, the six papers suggest a conceptual framework consisting of five interconnected dimensions: interaction, generation, performance, context, and human experience. Interactive technologies such as Leap Motion and Firefly expand the designer's interface with digital models. Parametric modeling generates and manages alternatives. Environmental simulation evaluates performance. Contextual analysis addresses climate, affordability, landscape, and identity. Finally, thermal-comfort assessment evaluates the consequences of design decisions for occupants.

The key editorial argument is therefore that the future of digital architecture should not be defined by increasingly complex geometry or increasingly sophisticated software. Its real contribution lies in creating an integrated design process in which technology supports informed decisions. Digital tools become most valuable when they connect computational exploration with environmental responsibility, socioeconomic realities, cultural identity, and human well-being.

The six papers collectively demonstrate this transition. They move from the manipulation of digital form toward the evaluation of architectural consequences. This shift represents an important direction for contemporary architectural research: from digital representation toward contextual, performance-based, and human-centered design. The challenge for architects and researchers is not simply to adopt new technologies, but to determine how those technologies can produce architecture that is more responsive to place, climate, resources, culture, and people.

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