

07 >> Connecting Digital Tools

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Return To Roots: Computational Modeling as a Tool For Architecture

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In the early stages of their engagement of computer technology, architects approached the technology as an assistive technology that would enhance the practice of architecture. The scope of the engagement was captured in the phrase 'computer-aided architectural design.' In the four decades since, the role of computer technology in architecture has gained a marked significance. The scope has now been extended for architects to contemplate 'totally computer-mediated architectural design.' The key in the development of digital tools to enhance the practice of architecture has been the facility with which the various tasks involved in the practice of architecture have been represented, enabled or enhanced using computer technology. Tools have always been created for their instrumentality, that is, their ability to assist in performing desired tasks. Given the scope of the engagement of computer technology by architects in the early phases, the assistive nature of tools formed the focus of researchers. The focus on this assistive nature has continued to remain in the minds of researchers who see assistance as the proper role of computer technology in architecture.

Papers submitted in this category reflect the range of assistive tools that are currently being developed by researchers. These papers include descriptions of a computational tool to design and visualize a vaulted tensegrity structure, a tool to review lighting simulations for lighting quality based on cluster analysis, a tool to visualize the solar access envelope on complex sites, a tool to create spatial form by sketching, design tools for architectural form generation that utilize the features of complex adaptive systems, a tool to explore shape grammars and shape computation, a tool to utilize gestures in a pen-based interface to design systems and a tool to link spatial character in spatial planning.

These digital representations of architectural entities and the digital manipulation of those entities suggest alternate means to produce architecture. Very few aspects of architectural design are now outside the scope of computer-based representation

and manipulation. Drawing, modeling, performance simulation, design collaboration, construction management and building fabrication are now routinely performed using computer-based technology because of the development of a wide range of tools. It is now possible to proceed from the conception of a design to its fabrication and construction in a computer-mediated environment. This success has revealed the untapped potential of the computational representation of architecture.

Advances in computing based on the study of natural processes such as neural processing, genetic evolution and emergence now suggest that the elusive nature of creative architectural thought can be articulated enough to be applied in a technologically-mediated environment. Digital tools may finally reveal what other architectural tools have hitherto concealed – the architectonics of architecture. Therein lays the promise. The future of digital tools rests on the extent to which architects can accept that exemplary architectural designs can be created in a computer-mediated environment and that digital thinking is indeed architectural thinking.

Ganapathy Mahalingam is currently the president of the Association for Computer-Aided Design in Architecture (ACADIA). He is also an Associate Professor of Architecture and Architecture Program Director in the Department of Architecture and Landscape Architecture at North Dakota State University in the United States of America. He holds a Ph.D. Architecture. Professor Mahalingam has firsthand experience in the creation of digital tools for architecture, having created software for the preliminary design of proscenium-type auditoriums. The creation of the software involved the definition of the auditorium as a virtual computational object, and an algorithmic process for auditorium design based on acoustical, functional and programmatic performance parameters.