EMERGENT DESIGNER: AN INTEGRATED RESEARCH AND DESIGN SUPPORT TOOL BASED ON MODELS OF COMPLEX SYSTEMS

This paper introduces an integrated research and design support tool, called Emergent Designer, developed at George Mason University. It is a tool that implements models of various complex systems, including cellular automata and evolutionary algorithms, to represent engineering systems and their related design processes. The system is intended for conducting design experiments in the area of structural design and for the analysis of their results. It implements state-of-the-art representations supporting generation of novel design concepts and efficient mechanisms for their subsequent optimization at the topological and sizing levels. The first part of this paper describes the overall system's architecture and the flow of information among its components. The actual system's implementation is discussed next and illustrated with several screen shots of the system's graphical user interface. Emergent Designer's novel approach to representing steel structural systems in tall buildings is also presented. It is based on the use of generative representations which utilize cellular automata to generate design concepts. Several design experiments are briefly described to demonstrate the feasibility of Emergent Designer in conceptual design as well as of design processes modeled by complex systems.

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