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**Hierarchical Design Optimization of Complex Systems**

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**Abstract**

The recent development of the analytical target cascading (ATC) methodology offers powerful approaches for assisting the design of complex systems by effectively coordinating mathematical models of subsystems at each level of a system hierarchy. ATC offers advantages over alternative methods of multidisciplinary design optimization because convergence properties have been proven, and the ATC process is known, under certain conditions, to generate the system optimum. ATC has been applied to design large systems including automobiles and architectural systems, and to coordinate and optimize product development decisions with respect to marketing, design, and manufacturing disciplines from an enterprise perspective. ATC also has the potential to exploit parallel computing resources, if available, to solve large problems quickly.

The goal of the proposed research is to examine the properties of ATC with respect to discrete variables and propose approaches to dealing with them in practical ways so that ATC can be used for problems that involve discrete decisions for industry.