

## Configuration Design: An Integrated Approach Using Grammars

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### ABSTRACT

A computational approach to design that integrates conceptual design, configuration design, and catalog component selection tasks overcomes some of the barriers to successful design automation. FFREADA is a design generation and optimization algorithm featuring hierarchical ordering of grammar based-design generation processes at different levels of abstraction. FFREADA is used to design hand-held, power drills and to develop an appropriate objective function for design optimization. The drill grammar expresses a vast space of design states that are not limited to any particular functional architecture or component configuration. (The algorithm's optimization runs operate in a space which exceeds  $20^{249}$  designs.) Good drill designs, those with values within 1% of the optimal solution, are found in minutes by sampling less than 0.15% of the design states. Optimal configurations are found for drills with three different torque requirements.

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