

**ABLOOS An Evolving Hierarchical  
Design Framework**

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January, 1991

Submitted in partial fulfillment of the  
requirements for the degree of  
**Doctor of Philosophy**

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## Abstract

The research reported in this thesis develops an approach toward a more effective use of hierarchical decomposition in computational design systems. The approach is based on providing designers a convenient interactive means to specify and experiment with the decompositional structure of design problems, rather than having decompositions pre-specified and encoded in the design system. Following this approach, a flexible decomposition capability is combined with an underlying design method to form the basis for an extensible and evolving framework for cooperative (human/computer) design.

As a testbed for this approach, the ABLOOS framework for layout design is designed and constructed as a hierarchical extension of LOOS.<sup>1</sup> The framework enables a layout task to be hierarchically decomposed, and for the LOOS methodology to be applied recursively to layout subtasks at appropriate levels of abstraction within the hierarchy; layout solutions for the subtasks are then recomposed to achieve an overall solution. Research results thus far are promising: ABLOOS has produced high quality solutions for a class of industrial layout design tasks (an analog power board layout with 60 components that have multiple complex constraints on their placement); the adaptability of the framework across domains and disciplines has been demonstrated; and, further development of ABLOOS is underway including its extension to layouts in 2 1/2D space and truly 3D arrangements.

The contribution of this work is in demonstrating an effective, flexible and extensible capability for hierarchical decomposition in design. It has also produced a more comprehensive layout system that can serve as a foundation for the further investigation of hierarchical decomposition in a variety of design domains.

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<sup>1</sup>Section 3.1.2 contains a brief overview of the LOOS methodology for layout design; a more detailed report on LOOS is available in [Flemming et al 89].