Mechanical Engineering Colloquium

October 3rd, 2014

Macdonald Engineering Building (MD) 267 from 11 - 12 pm

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Manufacturing Constraints and Multi-Phase
Shape and Topology Optimization via a Level-Set Method

Abstract: The principal topic of this talk is the implementation of manufacturing constraints in shape and topology optimization via a level-set method. Fabrication limitations are formulated as mathematical constraints and introduced in the optimization algorithm. More specifically, methods in order to ensure a maximum and minimum feature size, as well as a minimal distance between structural members, are proposed. 2d and 3d structural optimization examples are presented.

In addition, based on the same theoretical and modelization tools, a novel formulation for multi-phase optimization problems is proposed, which can be extended to the optimization of structures with functionally-graded properties. A key ingredient for the mathematical formulation of most problems throughout our work is the notion of the signed distance function to a domain. Applications in structural optimization, materials design using inverse homogenization and design of multi-functional structures are presented.

Keywords: Shape and topology optimization, level-set method, manufacturing constraints, thickness control, signed distance function, multi-phase optimization.