

FMfl2023 Program

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Title	Topological Design Problems and Integer Optimization
Abstract	<p>Topological design problems arise in many important engineering and scientific applications, such additive manufacturing and the design of cloaking devices. We formulate these problems as massive mixed-integer PDE-constrained optimization (MIPDECO) problems. We show that despite their seemingly hopeless complexity, MIPDECOs can be solved efficiently (at a cost comparable to a single continuous PDE-constrained optimization solve). We discuss two classes of such methods for solving MIPDECOs that do not require exhaustive tree-searches: rounding techniques, and trust-region methods. Surprisingly, both methods converge asymptotically under mesh refinement to a globally optimal integer solution under a convexity assumption. We illustrate these solution techniques with examples from topology optimization.</p>