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# IMMERSED COMPONENT-DRIVEN SHAPE OPTIMIZATION WITH ADAPTIVE MESH REFINEMENT.

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**Abstract:** We present a shape optimization framework via an ersatz material approach to design the layout of multiple engineering components within a hold-all domain. We use a level set function and Booleans operations to define the geometry. We approximate these Boolean operations with differentiable functions for our optimization. We then take the sign of this level set function, again using a differentiable function, to define an approximate indicator field which acts as a volume fraction variable in the finite element discretization of the elasticity equation. The gradient of the approximate indicator field is used to define the integrals for the boundary conditions at the material boundary including design dependent loading. We use adaptive mesh refinement to obtain a more efficient and accurate geometry description. Numerical examples with immersed boundary conditions are shown.