SHAPE OPTIMIZATION USING XFEM AND LEVEL SET METHODS

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ABSTRACT

This paper presents an intermediate approach between parametric shape optimization and topology optimization. It is based on using the recent Level Set description of the geometry and the novel eXtended Finite Element Method (XFEM). The method takes benefit of the fixed mesh work using XFEM and of the smooth curves description of the Level Set method. Design variables are shape parameters of basic geometric features like circles, triangles etc. The number of design variables of this formulation is small whereas various global and local constraints can be considered. The Level Set description allows to modify the connectivity of the structure as geometric features can merge or separate from each other. However no new entity can be introduced by the programme. A central problem that is investigated here is the sensitivity analysis and the way it can be carried out efficiently. Numerical applications revisit some classical (academic) benchmarks from shape and topology optimization.

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