An *hp* Adaptive Topological Optimization Design in 2D Elasticity

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Abstract

The Finite Element Method is used through it *hp* adaptive version to solve the topological optimization design in 2D Elasticity problem. A hierarchical basis for triangular elements is employed to obtain the shape functions used to discretize the domain. The refinement of the mesh is done in accordance with a local error estimator. This technique is employed to obtain a good result of stresses field and a better geometrical representation in the topological optimization iterative process. In this work, a possible way to obtain the optimum topology of 2D elasticity structure type, under geometrical and mechanical constraints, is presented. The methodology adopted was firstly presented by Souza de Cursi (1994). In this approach the topology is characterized by an unknown thickness map (ρ) which is introduced in the solids equilibrium equations in order to obtain a problem where (ρ) is explicitly involved. If one consider that optimal topology is done in accordance to minimum mass criterion, subject to von Mises plastic collapse constraint, then for the situation considered the determination of optimum thickness (ρ^*) is equivalent to the determination of optimal topology. In the case that ($\rho > 0$) one have a fully stressed design condition, otherwise, *i.e.* if ($\rho = 0$) one have the holes. This result leads to a non-linear equation where (ρ^*) is now explicitly involved.

References

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- Souza de Cursi, J. E. (1995), **Fast Topological Design in 2D Elasticity. Developments in Computational Techniques for Structural Engineering**, BHV Topping, 313-322, U.K.