Approximate Reanalysis in Topology Optimization

In the nested approach to structural optimization, most of the computational effort is invested in the solution of the finite element analysis equations. In this study, the integration of an approximate reanalysis procedure into the framework of topology optimization of continuum structures is investigated. The nested optimization problem is re-formulated to accommodate the use of an approximate displacement vector and the design sensitivities are derived accordingly. It is shown that relatively rough approximations are acceptable since the errors are taken into account in the sensitivity analysis. The implementation is tested on several small and medium scale problems, including two and three dimensional minimum compliance problems and two dimensional compliant force inverter problems. Accurate results are obtained and the savings in computation time are promising.

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