Talk announcement

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Continuation methods for higher-order topology optimization

In topology optimization the problem of finding the optimal distribution of material in a design domain can be formulated by means of a continuous density variable. We propose to replace the 0-1-box-constraints typically imposed on the values of the density variable by introducing an appropriate bijective mapping from the real numbers onto $(0, 1)$. This approach results in a separation of the optimization variable and the actual design variable and thus gives rise to an unconstrained optimization problem with respect to the former variable.

To compute candidates for locally optimal designs we aim to solve the first order optimality system via Newton's method. This requires the initial guess to be sufficiently close to the a priori unknown solution. We therefore opt for a homotopy (continuation) approach that does not require proximity of the initial guess and is based on solving a sequence of parametrized problems to approach the solution of the original problem.

The arising homotopy-type method is also compatible with the scalarization approach in multiobjective optimization to efficiently compute points on a Pareto curve.

Numerical results for PDE constrained design optimization problems are presented.