

A Novel and Efficient Scheme to Filter Structures out of Ground Structures

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ABSTRACT:

We present a novel and efficient scheme to filter structures out of ground structures, which is implemented using a nested elastic formulation for compliance minimization. The filter allows a multiple choice solution in which the user can either control the global equilibrium residual in the final topology or limit variations of the objective function (compliance) or consider both criteria simultaneously. The noteworthy feature of the approach is that a discrete solution is obtained where all the bars that belong to the topology have finite areas (i.e black and white solution) and thus there is no need to specify a minimum area, as usually done in the technical literature. The approach uses physical variables and allows control of the minimum ratio between the minimum and maximum area in the final topology. Numerical examples are given to provide insight and to illustrate the features of the present approach. The examples illustrate the remarkable efficiency of the method, especially for large scale structures/ground-structures.

Keywords: Ground structures. Filter. Topology optimization. Potential Energy. Least Squares. Tikhonov regularization. Generalized inverse. Pseudo inverse.