Thermomechanical Multiobjective Bidirectional Evolutionary Structural Optimization using weighted sum method for mean compliance and heat conduction problem

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Abstract:

This work proposes an approach of the Bidirectional Evolutionary Structural Optimization (BESO) method to deal with mean compliance minimization and heat conduction optimization in continuum linear static structures subjected to thermomechanical design-dependent loads considering a uniform temperature variation for each element as a result of steady heat conduction problem. Based on the weakly coupled thermo-elastic finite element theory, the equivalent nodal thermal load is obtained and applied to the elastic field as a physical body force in the mean compliance minimization problem. The thermomechanical analysis is accounted using the sequence coupling method, and a sensitivity analysis using the adjoint method for mean compliance minimization.

For the multiobjective thermomechanical optimization, the weighted sum method is applied. The present work analyzes the influence of the weighted sum method parameters in the thermomechanical coupling optimization and in the optimal topologies obtained using BESO method.

Numerical examples are presented to show the feasibility of the present approach. Good agreement has been observed when compared with results found in the literature.