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Optimization of hardening/softening behavior of plane frame structures using nonlinear normal modes - DTU Orbit (08/11/2017)

Optimization of hardening/softening behavior of plane frame structures using nonlinear normal modes

Devices that exploit essential nonlinear behavior such as hardening/softening and inter-modal coupling effects are increasingly used in engineering and fundamental studies. Based on nonlinear normal modes, we present a gradient-based structural optimization method for tailoring the hardening/softening behavior of nonlinear mechanical systems. The iterative optimization procedure consists of calculation of nonlinear normal modes, solving an adjoint equation system for sensitivity analysis and an update of design variables using a mathematical programming tool. We demonstrate the method with examples involving plane frame structures where the hardening/softening behavior is qualitatively and quantitatively tuned by simple changes in the geometry of the structures.

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