Practical design of a nonlinear tuned vibration absorber - DTU Orbit (08/11/2017)

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The aim of the paper is to develop a new nonlinear tuned vibration absorber (NLTVA) capable of mitigating the vibrations of nonlinear systems which are known to exhibit frequency-energy-dependent oscillations. A nonlinear generalization of Den Hartog's equal-peak method is proposed to ensure equal peaks in the nonlinear frequency response for a large range of forcing amplitudes. An analytical tuning procedure is developed and provides the load-deflection characteristic of the NLTVA. Based on this prescribed relation, the NLTVA design is performed by two different approaches, namely thanks to (i) analytical formulas of uniform cantilever and doubly-clamped beams and (ii) numerical shape optimization of beams with varying width and thickness. A primary system composed of a cantilever beam with a geometrically nonlinear component at its free end serves to illustrate the proposed methodology.

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