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Passive Vibration Control of a Piecewise Linear Beam System

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A linear Dynamic Vibration Absorber (DVA) is applied to suppress the vibrations in a harmonically excited piecewise linear beam system. Both experimental and numerical results are obtained and compared. The linear part of the beam system is modelled using the Finite Element Method. The number of degrees of freedom (dof) of this linear system is reduced using a dynamic reduction technique. Subsequently, a spring which only can take pressure forces is added to the model making it piecewise linear. A rotating mass unbalance realizes harmonic excitation. Finally, the linear DVA, modelled as a single dof mass-spring(-damper) system, is added to complete the system model. The undamped DVA is able to suppress the first harmonic resonance peak. The damped DVA guarantees vibration reduction over a wider frequency range. Next to the harmonic resonance also related subharmonic and superharmonic resonances are suppressed. Results of experiments and simulations show good resemblance.

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