Nonlinear modes, normal forms and invariant manifolds for vibrations of nonlinear musical instruments

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Abstract

This talk will focus on the concept of nonlinear modes and its applications to nonlinear vibrations of mechanical structures such as strings, plates and shells, viewed as elements of nonlinear musical instruments (string instruments, cymbals, gongs). The considered nonlinearities are geometrical, stemming from large amplitude oscillations with respect to the structures's thickness. The several definitions of nonlinear modes will be given and discussed, with a special focus on invariant manifolds in the phase space. The normal form theory and its link to internal resonance will be also addressed, as a powerful tool to predict the nonlinear modal interactions and to derive accurate reduced order models.

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