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Hysteresis suppression for primary and subharmonic 3:1 resonances using fast excitation.

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Summary: We analyze the effect of a fast harmonic excitation on hysteresis and on entrainment area in a forced van der Pol-Duffing oscillator near the primary and the 3:1 subharmonic resonances. Analytical treatment based on perturbation techniques is performed to capture the entrainment zone, the quasiperiodic modulation domain and the hysteresis area in the vicinity of the two resonances. Specifically, it is shown that a fast harmonic excitation can suppress hysteresis for a certain range of the fast excitation leading to a smooth transition between the quasiperiodic and the frequency-locked responses near these resonances. Furthermore, the influence of different system parameters on the hysteresis area has been investigated. In particular, the results reveal that the amplitude of the fast excitation and the nonlinear damping significantly affect the domain of hysteresis suppression near the primary and the 3:1 subharmonic resonances.

MSC:

70K30 Nonlinear resonances for nonlinear problems in mechanics

34C55 Hysteresis for ordinary differential equations

Cited in **10** Documents

Keywords:

fast harmonic excitation; frequency locking; hysteresis suppression; subharmonic resonance; quasiperiodic modulation; perturbation analysis

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