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Control of vibroimpact dynamics of a single-sided Hertzian contact forced oscillator. (English)

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Summary: The control of vibroimpact dynamics of a single-sided Hertzian contact forced oscillator is investigated analytically and numerically in this paper. The control strategy is introduced via a fast excitation and attention is focused on the response near the primary resonance. The fast excitation is added to the basic harmonic force, either through a harmonic force applied from above, or via a harmonic base displacement added from below, or by considering the stiffness of the oscillator as a periodically and rapidly varying in time. The results reveal that the threshold of vibroimpact response initiated by jump phenomenon near the primary resonance can be shifted toward lower or higher frequencies of the slow dynamic system depending on the fast excitation taken into consideration. It was also shown that the most realistic and practical way for controlling the vibroimpact dynamics is the introduction of a fast harmonic base displacement.

MSC:

70Q05 Control of mechanical systems

70K70 Systems with slow and fast motions for nonlinear problems in mechanics

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Keywords:

Hertzian contact; vibroimpact; high-frequency excitation; active control; perturbation analysis

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