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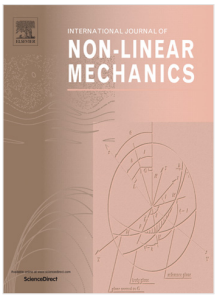

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Fast approximations of dynamic stability boundaries of slender curved structures

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Abstract

Curved beams and panels can often be found as structural components in aerospace, mechanical and civil engineering systems. When curved structures are subjected to dynamic loads, they are susceptible to dynamic instabilities especially dynamic snap-through buckling. The identification of the dynamic stability boundary that separate the non-snap and post-snap responses is hence necessary for the safe design of such structures, but typically requires extensive transient simulations that may lead to high computation cost. This paper proposes a scaling approach that reveals the similarities between dynamic snap-through boundaries of different structures. Such identified features can be directly used for fast approximations of dynamic stability boundaries of slender curved structures when their geometric parameters or boundary conditions are varied. The scaled dynamic stability boundaries of half-sine arches, parabolic arches and cylindrical panels are studied.

Keywords: Dynamic snap-through, Dynamic stability boundary, Scaling approach, Curved structures

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