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A New Asymptotic Technique for Nonlinear Dynamic Boundary Value Problems

Asymptotic approaches are well developed for nonlinear dynamics problems on spatially infinite domains. From the practical point of view systems with finite sizes are much more interesting. In this case there is a complicated interdependence between the fundamental frequency and an infinite number of resonant modes amplitudes, so that traditional analytical methods fail. We propose a new asymptotic technique based on the introduction of an artificial small parameter. Amplitude-frequency dependencies of a rod, a beam, a membrane, a plate and a shallow shell, placed in a nonlinear-elastic medium, are determined.