Analytical Evaluation of the Nonlinear Vibration of Coupled Oscillator Systems

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We consider periodic solutions for nonlinear free vibration of conservative, coupled mass-spring systems with linear and nonlinear stiffnesses. Two practical cases of these systems are explained and introduced. An analytical technique called energy balance method (EBM) was applied to calculate approximations to the achieved nonlinear differential oscillation equations where the displacement of the two-mass system can be obtained directly from the linear second-order differential equation using the first order of the current approach. Compared with exact solutions, just one iteration leads us to high accuracy which is valid for a wide range of vibration amplitudes as indicated in the presented examples.

Key words: Coupled Nonlinear Oscillators; Nonlinear Stiffness; Duffing Equation; Energy Balance Method.