Self-adaptive Lie Series Method for Structural Dynamics

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A self-adaptive direct integration method is of importance for dynamic problems, especially for variable mass system like launch vehicle with variable modal parameters. The idea of formulating self-adaptive method was motivated one year ago when the present authors investigated the dynamics responses of launch vehicle using Newmark integration method and symplectic method. In the problem, the frequencies are going higher and higher as the propellant is dissipated, one hopes to change the algorithm parameters self-adaptively. In present work, the authors reconsider Lie series method in a similar idea, the numerical dissipation and phase accuracy are taken as the criterion to select self-adaptively the terms used in Lie series method. One goal then can be reached that the amplitude and phase accuracies of the self-adaptive Lie series method hold as the dynamic characteristics changes. A few numerical comparisons validate the proposed method.

Keywords: Self-adaptive, direct integration method, phase error, Lie series method