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APPLICATION OF NON-PROBABILISTIC STATISTICAL ENERGY ANALYSIS IN SPACECRAFT'S VIBRO-ACOUSTIC ENVIRONMENT PREDICTION

Abstract

Statistical energy analysis is widely used in predicting the vibro-acoustic environment of complex structures, especially space aircraft. By integrating the interval analysis, optimization technique and Taylor expansion method, two non-probabilistic, set-theoretical statistical energy analyses are proposed for predicting the dynamical and acoustical response of the complex coupled system with uncertain parameters in high frequency domain. Interval method and convex models are used to describe the uncertainties. For both non-probabilistic methods, less information about the uncertain nature is required than that which is required concerning the probabilistic model. The comparison and the pertinence between the two non-probabilistic methods are made and discussed in this paper. At last, a typical Launch Vehicle structure is made as example to test the two non-probabilistic statistical energy analyses' feasibility and Monte-Carlo simulation is used to prove the correctness of the methods proposed.