Reliable Dynamic Analysis of Transportation Systems

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Abstract

In transportation engineering, dynamic analysis is an essential procedure for designing reliable systems. However, in current procedures of dynamic analysis for transportation systems, the possible presence of uncertainty in the system's mechanical properties and/or applied forces is not considered. In this work, a new method is developed for the dynamic analysis of continuous uncertain systems subjected to load induced by passage of moving vehicles for considering the presence of uncertainties. First, an interval formulation is used to quantify the uncertainty present in the system's mechanical characteristics and/or magnitude of dynamic force. Then, having the interval parameters, the bounds on modal responses of the continuous system are obtained leading to determination of the upper-bounds of total response that may be used for design purposes. An example problem that illustrates the behavior of the method and a comparison with Monte-Carlo simulations are presented.