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An improved method for fuzzy-interval uncertainty analysis and its application in brake instability study

Hui Lü [a], Zicheng Cai [a], Qianlang Feng [a], Wen-Bin Shangguan [a,*], Dejie Yu [b]

[a] School of Mechanical and Automotive Engineering, South China University of Technology, Guangzhou, Guangdong, China, 510641

[b] State Key Laboratory of Advanced Design and Manufacturing for Vehicle Body, Hunan University, Changsha, Hunan, China, 410082

Abstract

Most of the existing methods of brake squeal instability analysis are merely available to handle single type of uncertain case. In this study, an improved unified method is developed for uncertainty quantification, which is capable of handling two types of fuzzy-interval cases. In the first fuzzy-interval case, uncertain parameters of engineering structures are assumed as either fuzzy variables or interval variables, which exist in structures simultaneously and independently. In the second fuzzy-interval case, all uncertain parameters are represented by interval variables, but their lower and upper bounds just can be expressed as fuzzy variables instead of deterministic values. In the proposed method, fuzzy-boundary interval variables are introduced to handle fuzzy-interval uncertainties, and based on which an improved response analysis model is established. In the improved model, the fuzzy-boundary interval variables are firstly converted into interval-boundary variables by level-cut technique. Then by temporarily neglecting boundary uncertainties, the initial

* Corresponding author. E-mail address: sgwb@scut.edu.cn