RE-ANALYSIS METHODOLOGIES FOR SHAPE CHANGES IN NVH

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ABSTRACT – Finite-element (FE) analysis is a well-established methodology in structural dynamics. However, optimization studies can be prohibitively expensive because they require repeated FE analyses of large models. Various re-analysis methods have been proposed for gauge (e.g. thickness) changes with the premise to effectively calculate the dynamic response of a structure after a baseline design has been modified, without recalculating the new response. The parametric reduced-order modelling (PROM) and the combined approximations (CA) are two re-analysis methods, which can handle large model parameter changes in a relatively efficient manner. However, they can not efficiently handle large FE models with a large number of degrees of freedom (DOF) and a large number of design parameters, which are common in practice. For this reason, a modified CA (MCA) has been developed. In previous conferences, we have presented the advantages and disadvantages of the PROM, CA and MCA methods for only gauge changes. In this paper, we discuss the performance of the re-analysis methods for NVH problems with shape changes. A realistic vehicle finite-element model will be used to demonstrate their efficiency and accuracy and highlight their potential in shape optimization.

Biographical Note for Zissimos P. Mourelatos

Dr. Mourelatos is a Professor and the Chair of Mechanical Engineering Department at Oakland University in Rochester, MI, USA. He conducts research in the general areas of structural dynamics and reliability methods in engineering design. Before joining Oakland University, he spent 18 years at the General Motors Research and Development (GM R&D) Center. He received his Ph.D. in 1985 from The University of Michigan. He is active in the dynamics and vibrations as well as structural reliability communities, including membership in SAE, ASME and AIAA. His research interests include design under uncertainty, structural reliability methods, reliability analysis with insufficient data, Reliability-Based Design Optimization (RBDO), vibrations and dynamics, and NVH (Noise, Vibration and Harshness). Dr. Mourelatos has published over 120 journal and conference publications. He is the Editor-in-Chief of the *International Journal of Reliability and Safety*, an Associate Editor of the *ASME Journal of Mechanical Design* and a *SAE Fellow*.