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# COMPUTATIONAL DYNAMICS IN LOW- AND MEDIUM-FREQUENCY RANGES, REDUCED-ORDER MODEL AND UNCERTAINTY QUANTIFICATION

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Reduced-order models, substructuring techniques and uncertainty quantification are important aspects in computational dynamics, fluid-structure interactions, vibrations and vibroacoustics. Professor Roger Ohayon, for which this minisymposium is organized in his honor, has pioneered many aspects in these fields [1, 2, 3, 4]. In this framework, we will present the following new aspects: (i) Stochastic reduced-order model in low-frequency dynamics in presence of numerous local elastic modes [5], for which the high modal density makes the use of the classical modal analysis method not suitable; (ii) New ingredients useful for the nonparametric stochastic modeling of uncertainties (a) for structures with uncertain boundary conditions and/or coupling between substructures [6] and (b) for linear viscoelastic structures in the medium-frequency range [7]; (iii) Bayesian posteriors of uncertainty quantification in computational structural dynamics for low- and medium-frequency ranges [8].

In addition to some illustrations which will be given, three industrial applications will be presented. (1) The first one will deal with the robust design of a bladed disk in forced response with a detuning technique in presence of mistuning induced by the manufactured tolerances of the blades [9]. Mistuning is taken into account by using an adapted reduced-order model and uncertainties for blade mistuning are taken into account. (2) The second one will be devoted to the global deformation predictions in nonlinear structural dynamics of fuel assemblies [10]. The computational model ($3,147,060$ DOFs) simultaneously exhibits 51, 548 local elastic modes and only 245 global elastic modes in the same frequency band, [0, 400] Hz. A small dimension reduced-order model is constructed for predicting the deformations in the stiff parts and allows the nonlinear transient dynamical response of the structure with elastic stops and submitted to seismic excitation to be computed. (3) The last example will be devoted to the construction of a small dimension reduced-order model adapted to the prediction of the responses in the stiff parts of an automobile constituted of stiff parts (hollow bodies) and flexible parts (panels, elements and equipments attached to the stiff parts) [11]. The computational model (1, 462, 698 DOFs) exhibits 160 elastic modes (global and local modes) which are required for reaching convergence in [0, 120] Hz. The adapted small dimension (36) reduced-order model is constructed and uncertainties induced by modeling errors are taken into account.

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