On experimentally uncertainty quantification in structural dynamics and vibroacoustics: general framework

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Abstract

The theoretical and numerical aspects of uncertainty quantification (UQ) in engineering and science have been well developed over the past decades. The validation of the such theories, however, remains as challenging issue due to the lack of coherent and consistent experimental data upon desired performance. This is particularly important when dealing with numerical FEM models with uncertain inputs. In this paper, the fundamental concept of experimentally UQ will be discussed. The prompt will be on introducing a general framework by which UQ is performed using limited data available. The Bayes inference in UQ is presented in details. The UQ employing generalized polynomial chaos expansion is applied to structural dynamic problem with uncertain elastic and damping parameters. The available experimental data is then used to estimate the unknown coefficients of the expansion and updating the probability function of parameters. Once the experimentally identified inputs are known, statistical properties of uncertain structural responses are updated using numerical FEM model, cf. Fig.1.

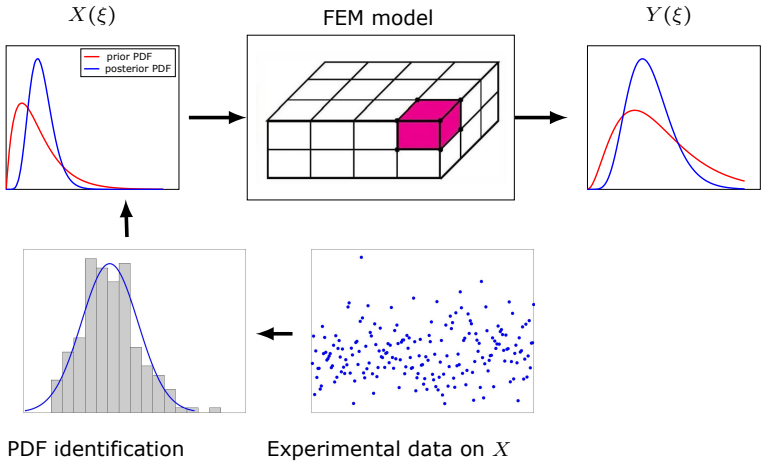

Figure 1: Using experimental data for updating uncertain inputs/outputs in FEM models

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