

The Role of Uncertainty Quantification in the Structural Dynamics Model Validation

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A path is outlined and implemented for the validation of predictive models using experimental data. The proposed framework relies on the probabilistic characterization of the predictions from structural dynamics models. Both modeling uncertainties and uncertainties associated with lack of data are considered as a simplified linear model is fitted to test data associated with a complex physical set-up. The presentation will highlight certain generic aspects of model validation along with some issues that uncertainty quantification paradigms are required to address to be relevant to the validation process.

In particular, data are collected from a structural dynamics experiment involving complex energy dissipation mechanisms and used to obtain a probabilistic characterization of the parameters of a linear model. The probabilistic character of the prediction of the resultant probabilistic model is used to determine the validity of the model in affirming claims regarding certain facts that are within its scope. The connection among experimental structural dynamics, model reduction, stochastic finite elements and decision theory are highlighted through the demonstration example.