Bayesian Parameter Identification in Plasticity

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The evaluation of the performance of engineering structures includes models of behaviour of materials, structural elements, loadings, external excitations etc. In assessment studies, there are several classes of uncertainty related to the lack of information on loading conditions/excitations, behaviour of material properties over time, geometry and boundary conditions which may be identified and reduced by the means of quality control or system monitoring and identification. [3]

In this work the focus is on the propagation of the a priori parametric uncertainty into a viscoplastic model describing the behavior of a steel structure and its quantification in the model response. To do so, the non-intrusive Stochastic Finite Element Method (SFEM) based on polynomial chaos is applied for different tests e.g. the relaxation and creep tests. [2]

Once the stochastic model, which covers the uncertainty, is provided, the uncertainty of the model parameters can be narrowed using measurement data such as displacement/strain via a Bayesian approach. In this study, a polynomial chaos based Bayesian method is employed. [1] The results are compared with a Markov Chain Monte Carlo method.

Moreover, different model's output like displacement of one node, edge or surface is observed in order to analyze the influence of observation on the identified model parameters and their accuracy.

References

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