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IDENTIFICATION OF ELASTOPLASTIC MATERIAL PROPERTIES IN A BAYESIAN SETTING

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The inverse problems in deterministic setting are typically ill-posed as the mapping from parameter to observable is usually not invertible. In order to assure the solution uniqueness and its stability under the data perturbations, the paremeter estimation has to be regularised or posed in a stochastic setting. The probabilistic identification introduces the parameters as the tensor-valued random fields, where the randomness reflects the uncertainty about the knowledge of the true values, and hence allows the incorporation of new information through Bayes's theorem [1]. The solution of an probabilistic inverse problem first requires modelling the stochastic forward problem, i.e. the rate-independent plasticity with general hardening whose material characteristics are assumed to be uncertain. By introducing the material properties in the form of tensor-valued random fields/stochastic processes we describe the irreversible and work-dissipating process via a stochastic convex energy function and evolution equations for internal variables. This allows the reformulation of the problem into the stochastic minimisation of smooth convex energy functional on discrete tensor product subspaces whose unique minimizer is obtained via a stochastic closest point projection algorithm. Its numerical computation is performed with the help of methods of functional approximation, i.e. a direct, purely algebraic way of computing the response in each iteration of Newton-like methods [2].

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