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# Bayesian Model Updating in Time Domain by an Iterated Model Reduction Technique

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## Abstract

The present study deals with time-domain structural model parameters identification. Specifically, an iterative model reduction algorithm is proposed to solve the transformation parameter such that no prior choices of response parameters are required. The time responses obtained from the reduced-order model and the responses at the measured degrees of freedom (DOF) are utilized to estimate the likelihood functions. The reduced-order model is subsequently implemented for updating unknown model parameters using Markov Chain Monte Carlo (MCMC) algorithm through a Metropolis–Hastings (MH) sampling scheme. The proposed methodology is elucidated numerically for an eight-storey shear building model to update its stiffness parameters considering different real-time earthquake data and noisy responses as evidence. The capability of the proposed model reduction technique coupled with the Bayesian updating algorithm is compared with the results obtained from existing model reduction approach. The numerical study focuses on the effect of reduced number of measurements for various measurement configurations in estimating the variation of errors in determining the structural model parameters. Subsequently, its effects on reducing the uncertainty of updated parameters are investigated.

**Keywords:** Time domain, Model updating, Markov chain Monte Carlo, Model reduction, Incomplete data