TRANSITIONAL MARKOV CHAIN MONTE CARLO METHOD
FOR BAYESIAN MODEL UPDATING AND MODEL CLASS SELECTION

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ABSTRACT

This paper presents a newly developed simulation-based approach for Bayesian model updating and model class selection, named the transitional Markov chain Monte Carlo approach (TMCMC). The idea behind TMCMC is to avoid the problem of sampling from difficult target probability density functions (PDF) but sampling from a series of PDFs that converge to the target PDF and that are easier to sample. The TMCMC approach is based on Markov chain Monte Carlo (MCMC), while it is more versatile and robust than MCMC. It is shown that TMCMC is able to draw samples from some difficult PDFs, e.g. multi-modal and very peaked PDFs. The TMCMC approach can also estimate evidence of the chosen probabilistic model class conditioning on the measured data, a key component for Bayesian model class selection and model averaging. Three examples are used to demonstrate the effectiveness of the TMCMC approach in Bayesian model updating, model class selection.

Key Words: Bayesian analysis, Stochastic simulation, Model updating, Model class selection