

# Identification of continuous-time Hammerstein systems by simultaneous perturbation stochastic approximation

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## ABSTRACT

This paper proposes an identification method for Hammerstein systems using simultaneous perturbation stochastic approximation (SPSA). Here, the structure of nonlinear subsystem is assumed to be unknown, while the structure of linear subsystem, such as the system order, is assumed to be available. The main advantage of the SPSA-based method is that it can be applied to identification of Hammerstein systems with less restrictive assumptions. In order to clarify this point, piecewise affine functions with a large number of parameters are adopted to approximate the unknown nonlinear subsystems. Furthermore, the linear subsystems are supposed to be described in continuous-time. Though this class of systems closely reflects the actual systems, there are few methods to identify such models. Hence, the SPSA-based method is utilized to identify the parameters in both linear and nonlinear subsystems simultaneously. The effectiveness of the proposed method is evaluated through several numerical examples. The results demonstrate that the proposed algorithm is useful to obtain accurate models, even for high-dimensional parameter identification.

## KEYWORDS

Systems identification; Stochastic approximation; Continuous-time Hammerstein models

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