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Outlier robust stochastic approximation algorithm for identification of MIMO Hammerstein models. (English) Zbl 1390.93819

Summary: This paper considers the robust recursive stochastic gradient algorithm for identification of multivariable Hammerstein model with a static nonlinear block in polynomial form and a linear block described by output-error model. The algorithm is designed for unknown parameters in vector form. It is assumed that there is a priori information about a distribution class to which a real disturbance belongs. Such class of distributions describes the presence of outliers in observations. The main contributions of the paper are: (i) design of robust stochastic approximation algorithm for MIMO Hammerstein models using robust statistics (Huber’s theory); (ii) design of general form of nonlinear block; (iii) a strong consistency of estimated parameter whereby proof is based on martingale theory, generalized strictly positive real condition and persistent excitation condition. The properties of algorithm are illustrated by simulations.

MSC:
93E12 Identification in stochastic control theory
93B35 Sensitivity (robustness)

Keywords:
multivariable Hammerstein model; outliers; Huber’s function; stochastic approximation; strong consistency

Full Text: DOI

References: