

非均匀Hammerstein-Wiener 系统的递阶随机梯度辨识算法

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Hierarchical stochastic gradient identification for Hammerstein-Wiener systems with non-uniformly sampling

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摘要

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摘要

针对一类非均匀数据采样Hammerstein-Wiener 系统, 提出一种递阶多新息随机梯度算法. 首先基于提升技术, 推导出系统的状态空间模型, 并考虑因果约束关系, 将该模型分解成两个子系统, 利用多新息遗忘随机梯度算法辨识出此模型的参数; 然后, 引入可变遗忘因子, 提出一种修正函数并在线确定其大小, 提高了算法的收敛速度及抗干扰能力. 仿真实例验证了所提出算法的有效性和优越性.

关键词: 参数估计, 随机梯度, Hammerstein-Wiener 系统, 递阶辨识, 可变遗忘因子

Abstract:

A hierarchical multi-innovation stochastic gradient identification algorithm is proposed for Hammerstein-Wiener(H-W) nonlinear systems with non-uniformly sampling. The corresponding state space models of H-W are derived by using the lifting technique. Considering the causality constraints, the H-W system is decomposed into two subsystems firstly. Then the model parameters are identified by using the multi-innovation based stochastic gradient algorithm with forgetting factors. In order to improve the convergent rate and the disturbance rejection, a new kind of variable forgetting factor algorithm is also presented. Simulation examples demonstrate that the proposed algorithm has fast convergence speed and is robust to the noise.

Key words: parameters estimation stochastic gradient Hammerstein-Wiener system hierarchical identification varying forgetting factor

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