

基于可变遗忘因子 RLS 的 Boost 转换器在线多参数辨识

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摘 要: 针对 Boost 转换器控制性能受电感和电容变化影响的问题, 提出了一种基于可变遗忘因子递推最小二乘法(recursive least squares method, RLS)的在线多参数辨识算法. 考虑电感电流纹波, 推导了精确的电感和电容辨识模型. 在此基础上, 研究了 RLS 算法中遗忘因子动态取值问题. 通过在算法的误差信号中恢复系统噪声的方法, 动态计算遗忘因子的取值, 解决了传统 RLS 算法难以兼顾稳态精度和参数跟踪能力的问题. 仿真结果表明, 该算法可以在动态条件下, 精确且快速地跟踪电感和电容值的变化, 且具有良好的鲁棒性.

关键词: Boost 转换器; 递推最小二乘法; 参数辨识; 可变遗忘因子

Variable Forgetting Factor RLS Based Online Multiparameter

Identification for Boost Converter

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Abstract: Aiming at the issue that the control performance of Boost converter is affected by inductance and capacitance variations, this paper proposed a variable forgetting factor RLS based online multiparameter identification algorithm. Considering the inductor current ripple, an accurate inductance and capacitance identification model was derived. On this basis, the dynamic value of forgetting factor in RLS algorithm was studied. By recovering system noises in the error signal of the algorithm, the value of forgetting factor was dynamically calculated, which solves the problem that the traditional RLS algorithm cannot balance steady-state accuracy and parameters tracking ability. The simulation results show that the algorithm can track the variations of inductance and capacitance accurately and quickly under dynamic condition, and has good robustness.

Key words: boost converter; recursive least squares method; parameter identification; variable forgetting factor

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