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基于Hammerstein 模型的感应电机变频器调速系统神经网络控制

梅从立, 黄文涛, 殷开婷, 刘国海

江苏大学电气信息工程学院, 江苏镇江212013.

Speed-regulating system for induction motor and inverter based on Hammerstein model and neural network control

MEI Cong-li, HUANG Wen-tao, YIN Kai-ting, LIU Guo-hai

School of Electronical and Information Engineering, Jiangsu University, Zhenjiang 212013, China.

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摘要

针对感应电机变频器调速系统的非线性特点, 提出一种基于Hammerstein 模型的神经网络控制方法. Hammerstein 模型由静态非线性模块和动态线性模块组成. 首先, 利用ARMA模型实现对感应电机变频器调速系统的线性动态模块辨识; 然后, 基于该辨识模型, 实现调速系统非线性静态模块神经网络逆模型辨识与系统直接逆控制; 最后, 针对控制过程中存在的电机负载扰动问题, 设计了神经网络直接逆控制器在线学习与控制策略. 仿真实验表明, 所提出的控制策略可以获得满意的控制效果.

关键词 : 感应电机, 变频器, Hammerstein 模型, 神经网络控制

Abstract :

For the nonlinear nature of the speed-regulating system of the induction motor and inverter, a control strategy based on the Hammerstein model and the neural network(NN) is proposed. The Hammerstein model is used to model the speed-regulation system of the induction motor and inverter. The model can be divided into two parts: the static nonlinear module and the dynamic linear module. Firstly, the auto-regressive and moving average(ARMA) model is used to identify the dynamic linear module of the speed-regulating system, and it is used as a reference model for identifying the inverse model of static nonlinear module in the framework of the model reference adaptive control method. The inverse model is modeled based on the NN and cascaded with the speed-regulating system to realize the NN direct inverse control strategy. Considering the existing of load disturbance, the on-line learning neural network direct inverse controller is also studied. Simulation results show that the proposed control strategy has high performance.

Key words : induction motor inverter Hammerstein model neural network control

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通讯作者: 梅从立 **E-mail**: clmei@ujs.edu.cn; clmei@126.com

作者简介: 梅从立(1978), 男, 副教授, 博士, 从事智能控制与智能计算等研究; 黄文涛(1989), 男, 硕士生, 从事感应电机智能控制的研究.

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