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基于神经元的异步电机直接转矩控制系统速度辨识

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摘要: 为避开传统的模型参考自适应(MRAS)方法需要求解反馈增益矩阵的问题, 在直接转矩控制理论基础上, 基于DSVM-DTC系统, 在静止两相 α - β 坐标系下建立异步电机数学模型, 推导出定子电流状态方程, 并转化为带有5个输入节点、1个输出节点的神经元定子电流自适应辨识可调模型。采用Window-Hoff学习规则, 推导出速度辨识公式, 把辨识出的速度估计值反馈回可调模型中, 在线修改可调模型参数, 使其输出的定子电流估计值逼近于实时检测的定子电流, 产生自适应性, 提高定子电流和电机转速的辨识精度。最后, 使用37 kW异步牵引电机参数在Matlab/Simulink软件平台上进行仿真。仿真结果表明: 辨识转速能够准确地跟踪实际转速, 动态响应性能好, 尤其当参数发生突变时, 系统具有很好的鲁棒性, 并且实现简单。

关键字: 神经元; 转速辨识; DSVM; 直接转矩控制

Speed identification in direct torque control system of induction motor based on neuron

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Abstract: In order to avoid solving the problems of obtaining feedback gain matrix in traditional model reference adaptive system (MRAS), the asynchronous motor mathematical model was established in stator α - β coordinate system based on direct torque control (DTC) theory, discrete space vector modulation (DSVM)-DTC system and stator current equation were gained according to this model and then the equation was transformed into neural element with five input nodes, and an output node as stator current adaptive identification modules. According to speed identification formula, the speed of motor was real-time estimated and transferred back to adjustable model whose parameters were modified and made close to the real value. Finally, the simulation was made in the Matlab/Simulink using parameters of 37 kW asynchronous motors. The results show that the identified speed can accurately track the actual speed and perform good dynamic response. When system parameters change, the system has good robustness and is easy for application.

Key words: neuron; speed identification; discrete space vector modulation (DSVM); direct torque control

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