

电力系统

混合有源电力滤波器的复合变结构电流控制

张莹¹, 吴敬兵²

1. 湖南铁道职业技术学院 轨道交通系, 湖南省 株洲市 412001; 2. 湖南大学 电气与信息工程学院, 湖南省 长沙市 410082

摘要:

针对传统比例-积分-微分(proportional integral differential, PID)控制器不能实现具有周期性特点的电网谐波电流无稳态误差跟踪的特点, 提出了一种新的PID型迭代学习控制算法, 同时建立了一种模糊规则并利用模糊推理对PID控制器的比例、积分和微分系数进行在线修正, 实现对系统的无差控制。在此基础上, 为提高系统的响应速度, 将PID迭代学习控制与滑模变结构控制有机结合, 提出了复合型变结构控制方法。该方法具有响应速度快、控制精度高、易于实现的特点。仿真和实验结果证明了该控制方法的可行性和有效性, 效果优于传统PID控制。

关键词: 有源电力滤波器 比例?积分?微分控制器 迭代学习控制 滑模变结构 模糊规则

Complex Variable Structure Current Control for Hybrid Active Power Filters

ZHANG Ying¹, WU Jingbing²

1. Department of Rail Transportation, Hunan Railway Professional Technology College, Zhuzhou 412001, Hunan Province, China; 2. College of Electrical and Information Engineering, Hunan University, Changsha 410082, Hunan Province, China

Abstract:

It is not ensured for traditional proportional integral differential (PID) controller to trace non-steady-state error of periodical signals. According to the feature that the reference signal of filtering system is such a periodical signal that is superposed by multi harmonics with different frequencies, a novel iterative learning control algorithm for PID controller is proposed and a set of fuzzy rules is established; on this basis the on-line correction of proportional coefficient, integral coefficient and differential coefficient of PID controller can be carried out by fuzzy reasoning to realize astatic control of PID control system. To speed up response speed of the control system, by means of integrating iterative learning control of PID controller with slide-mode variable structure control, a complex variable structure control method, which possesses the advantages such as high response speed, high control accuracy and easy to implement, is put forward. Results of simulation and experiments show that the complex variable structure control method is feasible and effective and it is better than traditional PID control.

Keywords: active power filter proportional integral differential (PID) controller iterative learning control sliding mode variable structure fuzzy rule

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通讯作者: 张莹

作者简介:

作者Email: zhing1230@163.com

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