

新型二阶系统自调整模糊 PD 控制器

郑伟勇, 李艳玮

(河南工程学院 计算机学院, 河南 郑州 451191)

摘要: 提出一种新型的自调整模糊比例微分控制器(NST-FPDC)以提高相应的控制精度,利用模糊控制原理在控制过程中实时调整控制器的比例及微分参数,实现了输出比例因子(SF)实时调节.此外,采用了一种简单的经验法则对控制变量的误差进行定义和归一化变换,使控制器的闭环增益连续变化.仿真结果表明:NST-FPDC的超调量和上升时间等关键性能均优于现有控制器的10%以上,部分性能则远优于其他控制器,验证了NST-FPDC的优越性及有效性.

关键词: 模糊比例微分控制器;自调整模糊逻辑控制器;比例因子;实时增益变化

中图分类号: TP13

文献标识码: A

文章编号: 1000-7180(2015)12-0085-05

A New Self-tuning Fuzzy Proportional-derivative Controller for High-order System

ZHENG Wei-yong, LI Yan-wei

(College of Computer, Henan Institute of Engineering, Zhengzhou 451191, China)

Abstract: To improve corresponding control precision, this paper presents a new self-tuning fuzzy proportional-derivative controller (NST-FPDC) with real-time adjusting its proportional-derivative parameters, which realize the real-time adjustment of output scaling factor (SF). Moreover, a simple heuristic rule is defined on the normalized change of error of the controlled variable in order to make continuous variation in the close-loop gain. As a Tested result, the overshoot, rise time and other key performances of NST-FPDC are superior to more than 10% of the existing controllers, and some performances far better other controllers, which clearly verify the superiority and effectiveness of NST-FPDC.

Key words: fuzzy proportional-derivative controller; self-tuning FLC; scaling factor; real-time gain variation

作者简介:

郑伟勇 男,(1978-),硕士,讲师.研究方向为模式识别与软件工程.

李艳玮 女,(1980-),硕士,讲师.研究方向人工智能与计算机应用. E-mail: zhengwy78@126.com

收稿日期: 2015-02-23; 修回日期: 2015-04-20

基金项目: 国家自然科学基金项目(61379079)