

论文

一类高阶非线性系统的级联自抗扰控制

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摘要:

针对类似板球系统的一类高阶、强耦合、不确定非线性系统, 利用backstepping 算法的思想, 提出以多个低阶自抗扰控制器级联实现控制的方法. 通过各低阶自抗扰控制器的扩张状态观测器观测出各级对象的内外扰动, 然后进行补偿, 较好地解决了高阶非线性系统的不确定性、耦合性及干扰抑制问题. 以板球系统的轨迹跟踪控制为例进行研究, 所得结果表明, 该方案适用于复杂高阶非线性级联系统的控制, 具有良好的动态特性及鲁棒性.

关键词: 高阶非线性系统; 自抗扰控制器; 级联系统; 板球系统

Control for a class of higher order nonlinear system based on cascade of active disturbance rejection controller

Abstract:

According to a kind of higher order, strong coupling, uncertainty nonlinear system, such as ball and plate system, a cascade control strategy with low order active disturbance rejection control(ADRC) is presented based on backstepping design idea. Because the disturbance and coupling are treated as an additional state variable, which is then estimated and compensated for in real time through the extended state observer(ESO) of low order ADRC, the problems of uncertainty nonlinear, coupling and disturbance rejection are all resolved. At the same time, the simulation studies of trajectory tracking with ball and plate system are made. The results show that the proposed strategy has better dynamic, robust characteristics and adjusts to the higher order, and complicated nonlinear object.

Keywords: higher order nonlinear system; active disturbance rejection controller; cascade system; ball and plate system

收稿日期 2010-09-20 修回日期 2010-12-19 网络版发布日期 2012-02-13

DOI:

基金项目:

高速运动条件下板球系统镇定与高精度轨迹控制研究

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