西安电子科技大学学报 2007 34 (1): 11-15+62 ISSN: 1001-2400 CN: 61-1076/TN

一类柔性悬索结构的自适应滑模控制

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收稿日期 修回日期 网络版发布日期 2007-1-31 接受日期

摘要 针对悬索结构强非线性和大滞后的特点，提出了一种自适应滑模控制方法．从线性化模型出发建立多输入-多输出滑模控制器，并将模型偏差、风载荷视为系统的外部扰动，通过引入参数自适应律在线估计总的外部扰动，并加以补偿． 在此基础上，针对大射电望远镜5m模型，采用离散悬索模型和自适应滑模控制方法对舱索控制系统进行了仿真，并与传统的PID控制方法进行了对比．结果表明，采用自适应滑模控制后，不但位置误差减小到PID控制时的40%，而且提高了鲁棒性．

关键词 悬索结构 滑模控制 自适应 大射电望远镜

分类号 TP273

Adaptive sliding mode control of a flexible cable structure

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Abstract

<FONT face=Verdana>According to the strong nonlinearity and big lag of the cable feed system, an adaptive sliding mode controller is proposed. The MIMO control law is derived with the linear model of the system. In addition, the model error and wind force are considered as the external disturbances, which are estimated on line and compensated. A series simulation is done with the parameters of a 5-meter scaled large spherical radio telescope model, and the results show that not only is the position error with the adaptive sliding mode controller reduced to 40% of that with the PID controller, but also the robustness of the system is improved.
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Key words cable system sliding mode control adaptive large spherical radio telescope

DOI:

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