论文

广义大系统非脆弱分散H_∞控制器设计

沃松林[1],刘锋[2],邹云[3]

1. 江苏技术师范学院
2.
3. 南京理工大学自动化学院

摘要：

针对控制器增益具有模有界扰动的情况, 研究广义大系统非脆弱分散H_∞控制问题. 基于广义系统的有界实引理和线性矩阵不等式(LMI) 方法, 分别给出了广义大系统非脆弱分散H_∞控制器和非脆弱分散H_∞保性能控制器存在的充分条件和设计方法. 最后通过仿真算例表明了所提出方法的有效性.

关键词： 分散H∞控制　非脆弱控制　保性能控制　线性矩阵不等式.

Non-fragile decentralized H∞ controller design for singular large-scale systems

WO Song-Iin,LI U Feng,ZOU Yun

Abstract: The non-fragile decentralized H_∞ control problem for singular large-scale systems is considered, the controller's
perturbations are value bounded. Based on the bounded real lemma of singular systems and by using the linear matrix
inequality(LMI) approach, the sufficient existence conditions and design approaches are presented for the corresponding
non-fragile decentralized ??∞ controllers, the non-fragile decentralized H_∞ and guaranteed cost controllers, respectively.
Finally, a numerical example is given to show the effectiveness of the proposed approach.

Keywords: decentralized H∞ control　non-fragile control　guaranteed cost control　linear matrix inequality

通讯作者：沃松林

作者简介：

作者Email: wosonglin2000@yahoo.com.cn

参考文献：

[1] Qingling Zhang. Singular Large-scale Systems' Decentralized Control and Robust Control [M]. Xi'an: Northwest Industry University Press, 1997. [2] Liu Yongqing, Guan Zhihong, Wen Xiangcai. Application of auxiliary simultaneous equations to the problem in the stabilization of singular and impulsive large scale systems [J]. IEEE Transactions on Circuits and Systems I: Fundamental Theory and Applications, 1995, 42(1): 46-51. [3] 沃松林，邹云. 参数不确定的广义大系统的分散鲁棒镇定控制[J]. 控制与决策,2004, 19（8）：931-934 [4] Songlin Wo, Yun Zou and Guodong Shi. Guaranteed cost control for discrete-time singular large-scale systems with parameter uncertainty [J]. Acta Automatica Sinica, 2005, 31(5): 808-814. [5] Songlin Wo, You Zou, Mei Sheng, Shengyuan Xu. Robust control for discrete-time singular large-scale systems with parameter uncertainty [J]. Journal of The Franklin Institute, 344 (2007): 97-106. [6] Zhaohui Jiang, Weihua Gui, Yongfang Xie. Robust output feedback control for

singular value bounded uncertainty large-scale systems [J]. Information and Control, 2006, 35 (1): 47-54 [7] Mao, W.-J. Robust decentralized stabilization of interval discrete-time singular large-scale systems [J]. IET Control Theory and Applications, 2010, 4(2): 244-252. [8] 陈跃鹏, 张庆灵, 徐天群. 基于观测器的具有对称结构的广义大系统的 分散控制[J]. 东北大学学报(自然科学版)，2001，22（4）：450-453. [9] Yongfang Xie, Weihua Gui, Zhaohui Jiang. Decentralized robust H-infinity descriptor output feedback control for value-bounded uncertain descriptor large-scale systems [J]. Journal of Control Theory and Applications, 2006, 4（2）:193-200. [10] 蒋朝辉, 桂卫华, 谢永芳. 数值界不确定性奇异大系统分散鲁棒 广义输出反馈控制[J]. 信息与控制, 2006,35(1): 47-54. [11] 桂卫华；蒋朝辉；谢永芳. 基于广义输出反馈的奇异大系统分散鲁棒 控制 [J]. 系统工程与电子技术，2006，28（5）：736-740. [12] 沃松林，史国栋，邹云.不确定广义大系统的 保性能控制[J]. 控制理论与应用，2009，26（9）：1035-1040. [13] Keel, Bhattacharyya. Robust, Fragile, or Optimal [J].IEEE Trans on Automatic Control, 1997, 42 (8): 1098-1105. [14] Junlin Xiong, Qingling Zhang. Optimal non-fragile guaranteed cost control for of structured uncertain system with time-delay [J]. Control Theory and Applications, 2005, 22 (3): 503-506. [15] Rui Wang, Jiaxin Feng, Jun Zhao. Non-fragile controller design method for a class of linear uncertain switched systems [J]. Control and Decision, 2006, 21 (7): 735-744 [16] Lien, CH. Non-fragile guaranteed cost control for uncertain neutral dynamic systems with time-varying delays in state and control input [J]. Chaos, Solitons and Fractals; 2007, 31(26): 889-899. [17] Jong-Hae Kim; Do-Chang Oh. Robust and Non-fragile Control for Descriptor Systems with Parameter Uncertainties and Time Delay [J]. International Journal of Control, Automation, and Systems; 2007, 5(1): 8-14. [18] Chang-Hua Lien. H∞ non-fragile observer-based controls of dynamical systems via LMI optimization approach [J]. Chaos, Solitons and Fractals; 2007, 34(2): 428-436. [19] Ju H. Park. Robust non-fragile control for uncertain discrete-delay large-scale systems with a class of controller gains variations [J]. Applied Mathematics and Computation, 2004, 149 (1): 147-164. [20] Yi-You Hou; Teh-Lu Liao; Jun-Juh Yan; Chang-Hua Lien. Non-fragile Control for Singular Systems with State and Input Time-varying Delays [J]. International Journal of Nonlinear Sciences and Numerical Simulation; 2007, 8(1): 31-40. [21] 肖豪; 沃松林，广义大系统的非脆弱分散控制 [J].《江南大学学报(自然科学版)》,2009,8(2): 140-144. [22] Xiao Hao, Wo Songlin. Non-fragile Decentralized Guaranteed Cost Control for Uncertain Singular Large-scale Systems. Proceedings of the 29th Chinese Control Conference, July 29-31, 2010, Beijing, China，5803-5808. [23] I. Masubuchi, Y. Kamitane, A. Ohara. And N. Suda. Control for descriptor systems: A matrix inequalities approach [J]. Automatica, 1997, 33(4): 669-673.

本刊中的类似文章

1．纪志成, 朱嵘嘉, 沈艳霞.一类不确定线性时滞系统的保性能研究[J]. 控制与决策, 2005,20(8): 943-946

2．沃松林；史国栋;邹云.具有非线性扰动的离散奇异时滞系统的保性能控制[J]. 控制与决策, 2007,22(6): 670-674

3．陈珺;刘飞.非线性系统具有圆盘极点约束的鲁棒模糊控制[J]. 控制与决策, 2007,22(9): 983-988

4．张颖;段广仁.不确定离散切换系统具有极点约束的保性能控制[J]. 控制与决策, 2007,22(11): 1269-1273

5．陈国定, 俞　立, 杨马英, 褚　健.不确定离散系统的输出反馈保性能控制[J]. 控制与决策, 2002,17(1): 117-119

6．杨珺;张化光;郑成德.基于模糊双曲模型的可靠控制器设计[J]. 控制与决策, 2008,23(2): 167-170

7．林瑞全;杨富文.具有反馈增益不确定的Delta算子系统H∞控制[J]. 控制与决策, 2007,22(11): 1302-1304

8．李琴;张庆灵;安祎春.不确定离散广义系统的时滞相关非脆弱无源控制[J]. 控制与决策, 2007,22(8): 907-911

9．曾丽兰;王道波;陈谋;陈细松.基于互质因子摄动的系统非脆弱鲁棒解耦控制[J]. 控制与决策, 2007,22(5): 573-576

10．张乐;井元伟.基于非脆弱控制器设计的不确定模糊系统稳定性研究[J]. 控制与决策, 2007,22(3): 329-332

11．沃松林;史国栋;邹云.具有非线性扰动的广义系统的鲁棒H_∞控制[J]. 控制与决策, 2009,24(3): 356-360

12．郝飞;赵翔辉.Lurie网络化控制系统的保性能控制[J]. 控制与决策, 2009,24(5): 717-722

13．康军;戴冠中.基于网络QOS的网络化控制系统保性能控制[J]. 控制与决策, 2009,24(7): 973-978

14．朱灵波;戴冠中;康军;LIN-SHI Xuefang.具有传感器故障的网络控制系统保性能可靠控制[J]. 控制与决策, 2009,24(7): 1050-1054

15．刘毅;赵军.一类不确定离散切换模糊时滞系统的鲁棒非脆弱控制[J]. 控制与决策, 2009,24(7): 1070-1073