Journal of Control Science and Engineering

Journal of Control Science and Engineering
Volume 2008 (2008), Article ID 489124, 8 pages
doi:10.1155/2008/489124

Research Article

Discrete-Time Sliding-Mode Control of Uncertain Systems with Time-Varying Delays via Descriptor Approach

Maode Yan,[1,2] Aryan Saadat Mehr,[3] and Yang Shi[2]

[1]School of Electronic and Control Engineering, Chang'an University, Xi'an 710064, China
[2]Department of Mechanical Engineering, University of Saskatchewan, 57 Campus Drive, Saskatoon, SK, S7N 5A9, Canada
[3]Department of Electrical and Computer Engineering, University of Saskatchewan, 57 Campus Drive, Saskatoon, SK, S7N 5A9, Canada

Received 12 February 2008; Accepted 2 June 2008

Academic Editor: Pablo Iglesias

Abstract

This paper considers the problem of robust discrete-time sliding-mode control (DT-SMC) design for a class of uncertain linear systems with time-varying delays. By applying a descriptor model transformation and Moon's inequality for bounding cross terms, a delay-dependent sufficient condition for the existence of stable sliding surface is given in terms of linear matrix inequalities (LMIs). Based on this existence condition, the synthesized sliding mode controller can guarantee the sliding-mode reaching condition of the specified discrete-time sliding surface for all admissible uncertainties and time-varying delays. An illustrative example verifies the effectiveness of the proposed method.