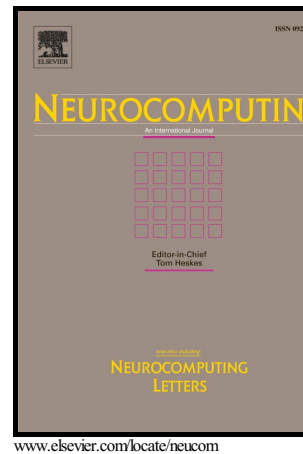


Author's Accepted Manuscript

An Integral Sliding Mode Control Approach to
Observer-Based Stabilization of Stochastic Ito[^]
Descriptor Systems

Jinghao Li, Qingling Zhang



PII: S0925-2312(15)01313-2
DOI: <http://dx.doi.org/10.1016/j.neucom.2015.09.006>
Reference: NEUCOM16073

To appear in: *Neurocomputing*

Received date: 6 June 2015
Revised date: 24 August 2015
Accepted date: 1 September 2015

Cite this article as: Jinghao Li and Qingling Zhang, An Integral Sliding Mode Control Approach to Observer-Based Stabilization of Stochastic Ito[^] Descriptor Systems, *Neurocomputing*, <http://dx.doi.org/10.1016/j.neucom.2015.09.006>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain



An Integral Sliding Mode Control Approach to Observer-Based Stabilization of Stochastic Itô Descriptor Systems

Jinghao Li^a, Qingling Zhang^{ab*}

^aInstitute of Systems Science, Northeastern University, Shenyang, China

^bState Key Laboratory of Synthetical Automation for Process Industries, Northeastern University, Shenyang, China

*Corresponding author: E-mail qlzhang@mail.neu.edu.cn. Tel. +86 024 83671336

Abstract

This paper is concerned with sliding mode observer design and observer-based sliding mode controller synthesis for stochastic Itô descriptor systems. A novel integral sliding surface, which involves a product of sliding variable and a negative definite matrix, is constructed for the error system. It is shown that the product term not only has a stabilizing effect on the sliding variable, but also is beneficial to remove a restrictive assumption often employed in the sliding mode control for stochastic Itô systems. Observer-based sliding mode controllers are designed to ensure the retainability of sliding surfaces from the beginning almost surely, and the asymptotically mean square admissibility of resultant sliding motion can be determined by solving a linear matrix inequality(LMI). Two examples are performed to check the theoretical findings.

Keywords: Integral sliding surface, Sliding mode observer, Descriptor systems, Observer-based sliding mode control, Stochastic Itô systems.

1. Introduction

Descriptor system is also referred to as singular system, semistate system, differential algebraic system, which can provide an integrated description of dynamical system in practice and characterize a much wider range of system than regular system. Applications cover a variety of fields, including large-scale system with interconnections, electrical circuit, constrained mechanical system, bioeconomic system and so forth[1, 2]. In the past decades, a large number of research results related to descriptor system have been extensively reported, such as, stability and stabilization [3, 4, 5], H_∞ control and passive control [6, 7, 8], and observer design [9, 10], for more details on such system, please see monographs[1, 2, 11, 12].

As we know, it is inevitable that stochastic phenomenon widely exists in many branches of sciences and practical engineering, and more and more attention is devoted to the studies of stochastic models[13, 14]. As a typical stochastic model, stochastic Itô system has found many applications in aircraft, chemical engineering, biological system, and distributed networks [15]. The wide applications have greatly stimulated the development of stochastic Itô system. For example, the observer-based sliding mode control for stochastic delay system has been studied in [16]; the observer-based integral sliding-mode control for a class of stochastic Itô systems subject to simultaneous input and output disturbances has been considered via descriptor system approach in [15]; robust stabilization for uncertain stochastic delay system has been analyzed by integral sliding mode technique in [17]. On account of the wide applications of descriptor system and the inevitability of stochastic noise, the stochastic Itô descriptor system is more reasonable and realistic than the regular one. Recently, the investigation for such system has received increasing concerns[18, 19, 20, 21, 22, 23]. On the other hand, due to the limitation of measuring device or the high costs, state vector is not always

Download English Version:

<https://daneshyari.com/en/article/10326472>

Download Persian Version:

<https://daneshyari.com/article/10326472>

[Daneshyari.com](https://daneshyari.com)