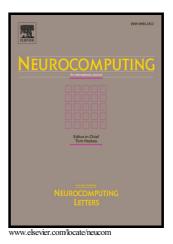
Author's Accepted Manuscript

Orientation of Radio-Telescope Secondary Mirror via Adaptive Sliding Mode Control

Sajjad Keshtkar, Eusebio Hernandez, Armando Oropeza, Alexander Poznyak



 PII:
 S0925-2312(16)31422-9

 DOI:
 http://dx.doi.org/10.1016/j.neucom.2016.08.116

 Reference:
 NEUCOM17777

To appear in: Neurocomputing

Received date: 24 November 2015 Revised date: 13 May 2016 Accepted date: 11 August 2016

Cite this article as: Sajjad Keshtkar, Eusebio Hernandez, Armando Oropeza and Alexander Poznyak, Orientation of Radio-Telescope Secondary Mirror via Adaptive Sliding Mode Control, *Neurocomputing* http://dx.doi.org/10.1016/j.neucom.2016.08.116

This is a PDF file of an unedited manuscript that has been accepted fo publication. As a service to our customers we are providing this early version o 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

ACCEPTED MANUSCRIPT

Orientation of Radio-Telescope Secondary Mirror via Adaptive Sliding Mode Control

Sajjad Keshtkar^{a,*}, Eusebio Hernandez^b, Armando Oropeza^b, Alexander Poznyak^{a,c}

^aDepartment of Automatic Control, CINVESTAV - IPN, Mexico City 07360, Mexico ^bESIME Unidad Ticoman, Instituto Politecnico Nacional, Mexico City 07340, Mexico ^cUniversidad Automa del Carmen, 24100 Cd del Carmen, Mexico

Abstract

In this work a parallel manipulator (Stewart platform) is used to align and maintain the position of the secondary mirror of a radio-telescope. The six degrees of freedom platform gives the significant advantage of reaching the maximum performance for the positioning tasks. The near-singularity condition of the platform is analyzed and is handled by implementation of a new control law based on sliding mode with inner regularization procedure. Herein, the finite-time convergence of closed-loop system derived from designed control in the presence of external as well as internal disturbances/uncertainties is proved. The effectiveness of the proposed controller is verified via numerical simulation. We show that Sliding Mode Control with a gain matrix adaptation based on the Equivalent Control method can significantly reduce the undesirable chattering effect an therefore avoid the possible damages.

Keywords: Sliding mode control; Adaptive control; Near-singularity condition; Inner regularization procedure; Parallel platform; Radio-telescope orientation

1. Introduction

The radio-telescope antenna is a a widely used device to receive the radio-frequency radiation emitted by extraterrestrial sources and satellites. Since radio wavelengths are much longer than those of visible light, radio telescopes then must be very large in order to attain the resolution of optical telescopes. Radio telescopes can be classified differently, however depending on their design, they can be divided in one and dual reflector antennas. One-reflector antennas are the most familiar type of radio telescopes consisting of a parabolic antenna, so-called dish, which operates in the same manner as a television-satellite receiving antenna, to focus the incoming radiation onto a small antenna referred to as the feed, a term that originated with antennas used in radar transmissions.

Preprint submitted to Neurocomputing

^{*}Corresponding author

Email address: skeshtkar@ctrl.cinvestav.mx (Sajjad Keshtkar)

دريافت فورى 🛶 متن كامل مقاله

- امکان دانلود نسخه تمام متن مقالات انگلیسی
 امکان دانلود نسخه ترجمه شده مقالات
 پذیرش سفارش ترجمه تخصصی
 امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
 امکان دانلود رایگان ۲ صفحه اول هر مقاله
 امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
 دانلود فوری مقاله پس از پرداخت آنلاین
 پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات
- ISIArticles مرجع مقالات تخصصی ایران