

Accepted Manuscript

Regular paper

Smith-Fuzzy Fractional Control of Systems with Time Delay

Isabel S. Jesus, Ramiro S. Barbosa

PII: S1434-8411(17)30349-7

DOI: <http://dx.doi.org/10.1016/j.aeue.2017.05.014>

Reference: AEUE 51885

To appear in: *International Journal of Electronics and Communications*

Received Date: 12 February 2017

Accepted Date: 8 May 2017

Please cite this article as: I.S. Jesus, R.S. Barbosa, Smith-Fuzzy Fractional Control of Systems with Time Delay, *International Journal of Electronics and Communications* (2017), doi: <http://dx.doi.org/10.1016/j.aeue.2017.05.014>

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 proof before it is published in its final 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.



Smith-Fuzzy Fractional Control of Systems with Time Delay

Isabel S. Jesus, Ramiro S. Barbosa

*GECAD – Knowledge Engineering and Decision Support Research Center
Institute of Engineering / Polytechnic of Porto (ISEP/IPP), Dept. of Electrical Engineering
Rua Dr. Antonio Bernardino de Almeida, 431, 4200-072 Porto, Portugal; {isj,rsb}@isep.ipp.pt*

Abstract

The fractional calculation is over 300 years old, but only in the last decades its application arisen in many areas of science and engineering. The explanation for this expansion in the scientific and tecnologic worlds is due to the good results obtained in solving different problems, which have overcome the classics. On the other hand, in the control area there was an increasing interest in the development of new strategies, which resulted in new algorithms where the use of the fractional calculus revealed an helpfull tool. In this paper we apply the fractional order concepts into two systems with time delay. Several algorithms are investigated and compared, when integrated within a Smith predictor structure and with an optimal fuzzy fractional $PD^\beta+I$ controller in which the parameters are tuned by a genetic algorithm. Simulations are presented assessing the performance of the proposed fractional schemes.

Keywords: Genetic Algorithm, Optimization, PID controller, Fuzzy Logic, Fractional Control, Smith Predictor, Fuzzy Controller

1. Introduction

Fractional calculus (FC) is a generalization of the integral and differential equations to an arbitrary order, which are used to model real systems as well in the process control. In fact, the FC gives more flexibility in the control of systems, due to have more degrees of freedom, which leads to the improvement in their control and tuning. Some works and applications in this area are in the field of thermal systems, electrical transmission lines, mechanical or robotic systems [1, 2, 3, 4, 5, 6].

Download English Version:

<https://daneshyari.com/en/article/4953987>

Download Persian Version:

<https://daneshyari.com/article/4953987>

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