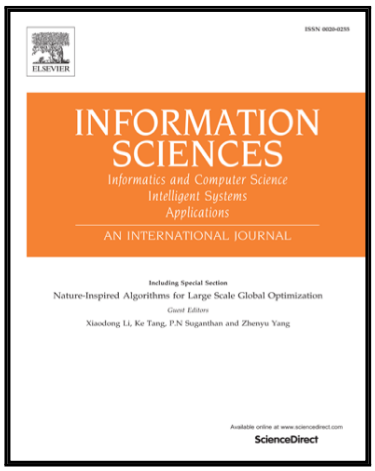

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Adaptive Fuzzy Control for a Class of Unknown Fractional-Order Neural Networks Subject to Input Nonlinearities and Dead-Zones

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Abstract

This paper presents an adaptive fuzzy control (AFC) for uncertain fractional-order neural networks (FONNs) with input nonlinearities and unmodeled dynamics. System uncertainties and unknown parts of the nonlinear input are approximated by fuzzy logic systems (FLSs). Based on some proposed stability analysis criteria for fractional-order systems (FOSs), an AFC is designed to guarantee the asymptotic stability of the controlled system. Fractional-order adaptive laws (FOALs) are constructed to update adjustable parameters of FLSs. Our method can be used to control FONNs with/without sector nonlinearities in control inputs. It also allows us to generalize many existing control methods that are valid for integer-order neural networks to FONNs by using the proposed method. Finally, the effectiveness of the proposed method is demonstrated by simulation results.

Keywords: Adaptive fuzzy control, sector nonlinearity, fractional-order neural network, dead-zone

1. Introduction

Up to now, neural networks (NNs) have received increasing attention in many fields [2, 13, 17, 28, 29, 34, 35, 45]. The NN that will be considered in this paper is called fractional-order neural network (FONN), which is an extension of

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