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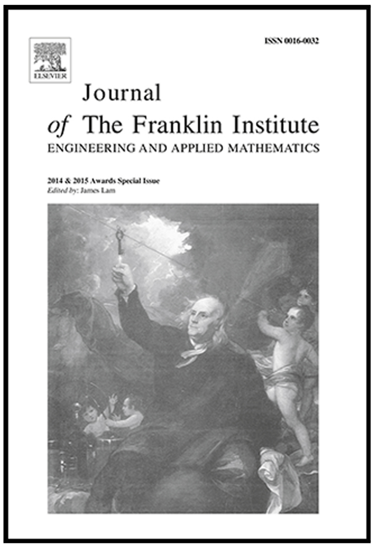

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Adaptive neural tracking control for a class of uncertain nonstrict-feedback nonlinear systems

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Abstract

This paper investigates adaptive neural tracking control problem for nonstrict-feedback nonlinear systems with completely unknown uncertainties. Superior to the existing results that only bounded error tracking performance can be achieved, the designed controllers of this paper will guarantee the asymptotic tracking performance under the neural network approximation framework. This is accomplished by using a new control strategy where a proportional-integral (PI) compensator that can be conveniently implemented in practice is introduced. Meanwhile, a novel Lyapunov function is developed, whose upper-right Dini derivative will be used to construct the desired controllers and adaptive laws. Finally, simulation results are given to show the advantages and effectiveness of the proposed new design technique over some existing ones.

Keywords: Neural network, completely unknown uncertainty, PI compensator, backstepping.

1. Introduction

In practice, many systems are commonly encountered with uncertainties due to unavoidable parameter variation, disturbance input and component failure, etc. As a very powerful control method of dealing with uncertainties, the adaptive control has been paid much attention for both linear and nonlinear systems over the a past few years, and many significant progresses have been made, see, eg., [1, 2, 3, 4, 5, 6] and the references therein.

In the nonlinear context, a systematic design procedure of adaptive regulation and tracking schemes for a class of feedback linearizable nonlinear systems was developed in [7]. On the other hand, nonlinearities can also be dealt

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