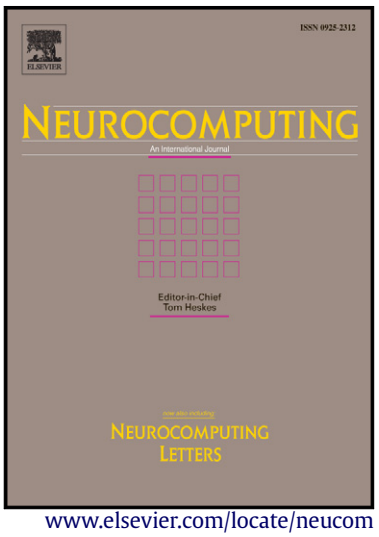

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Simplified adaptive neural control of strict-feedback nonlinear systems ⋆

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Abstract

This paper presents a simplified adaptive backstepping neural network control (ABNNC) strategy for a general class of uncertain strict-feedback nonlinear systems. During the backstepping design, all unknown functions at intermediate steps are passed down such that only a single neural network (NN) is needed to approximate a lumped uncertainty at the last step. The closed-loop system achieves practical asymptotic stability in the sense that all involved signals are bounded and the tracking error converges to a small neighborhood of zero. The contribution of this study is that the complexity growing problem of the traditional ABNNC design is substantially eliminated for a general class of uncertain strict-feedback nonlinear systems, where the constraints of control parameters that guarantees closed-loop stability is clearly demonstrated. An illustrative example has been provided to verify effectiveness of the proposed approach.

Key words: Adaptive control, backstepping, neural network, function approximation, strict-feedback, nonlinear system.

1 Introduction

Recent years, adaptive approximation-based control using fuzzy systems or neural networks (NNs) has attracted great concern due to its effectiveness of modeling functional uncertainties in nonlinear systems [1]. Some recent results

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