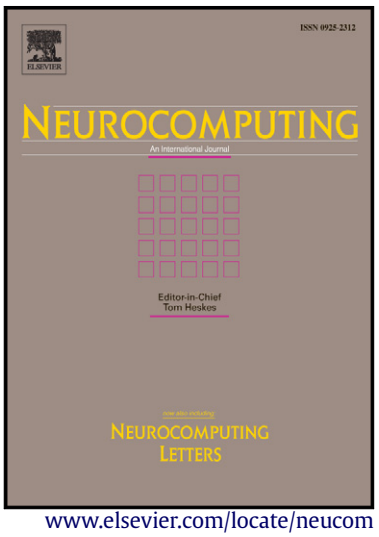

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Robust adaptive neural network control of a class of uncertain strict-feedback nonlinear systems with unknown dead-zone and disturbances☆

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Abstract

In this paper, a robust adaptive neural control design approach is presented for a class of perturbed strict-feedback nonlinear systems with unknown dead-zone. In the controller design, different from existing methods, all the virtual control laws need not be actually implemented at intermediate steps, and only one actual robust adaptive control law is constructed by approximating the lumped unknown function of the system with a single neural network at the last step. By this approach, the structure of the designed controller is much simpler since the causes for the problem of complexity growing in existing methods are eliminated. Stability analysis shows that the proposed scheme can guarantee the uniform ultimate boundedness of all the closed-loop system signals, and the steady-state tracking error can be made arbitrarily small by appropriately choosing control parameters. Simulation studies demonstrate the effectiveness and merits of the proposed approach.

Keywords: robust adaptive control, single neural network, uncertain strict-feedback nonlinear systems, dead-zone, disturbances

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