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摘要

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An Optimal Control Scheme for a Class of Discrete-Time Nonlinear Systems with Time Delays Using Adaptive Dynamic Programming

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Abstract
In this paper, an optimal control scheme for a class of nonlinear systems with time delays in state and control variables with respect to a quadratic performance index function is proposed using a new iterative adaptive dynamic programming (ADP) algorithm. By introducing a delay matrix function, the explicit expression of the optimal control is obtained using the dynamic programming theory and the optimal control can iteratively be obtained using the adaptive critic technique. Convergence analysis is presented to prove the performance index function to reach the optimum by the proposed method. Neural networks are used to approximate the performance index function, compute the optimal control policy, solve delay matrix function and model the nonlinear system, respectively, for facilitating the implementation of the iterative ADP algorithm. Two examples are given to demonstrate the validity of the proposed optimal control scheme.
Key words Adaptive dynamic programming approximate dynamic programming time delay optimal control nonlinear system neural networks
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