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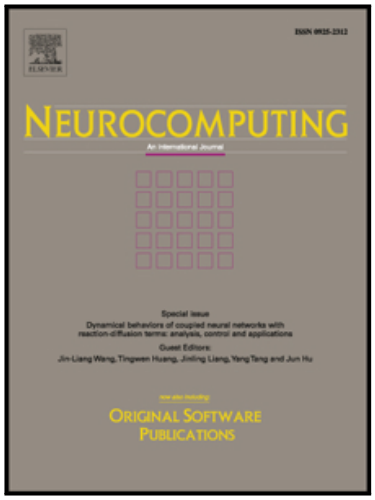

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Neural-Network-Based Synchronous Iteration Learning Method for Multi-Player Zero-Sum Games

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Abstract

In this paper, a synchronous solution method for multi-player zero-sum games without system dynamics is established based on neural network. The policy iteration (PI) algorithm is presented to solve the Hamilton-Jacobi-Bellman (HJB) equation. It is proven that the obtained iterative cost function is convergent to the optimal game value. For avoiding system dynamics, off-policy learning method is given to obtain the iterative cost function, controls and disturbances based on PI. Critic neural network (CNN), action neural networks (ANNs) and disturbance neural networks (DNNs) are used to approximate the cost function, controls and disturbances. The weights of neural networks compose the synchronous weight matrix, and the uniformly ultimately bounded (UUB) of the synchronous weight matrix is proven. Two examples are given to show that the effectiveness of the proposed synchronous solution method for multi-player ZS games.

Key words: Adaptive dynamic programming, Approximate dynamic programming, Adaptive critic designs, Multi-player, Iteration learning, Neural network
PACS:

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