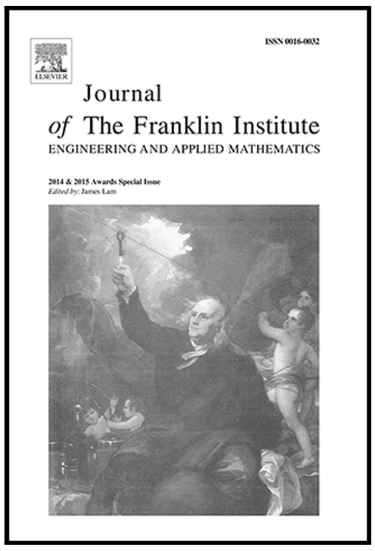

Discrete-time adaptive controller based on non-switch reaching condition and compact system dynamic estimator

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Discrete-time adaptive controller based on non-switch reaching condition and compact system dynamic estimator

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Abstract

An adaptive controller is proposed for a class of compact discrete-time systems when the controlled plants have unknown dynamics. The special structure of artificial neural networks (ANN) with membership activation functions is established to determine a pseudo-partial derivative (PPD) of the unknown plant. The on-line learning algorithm is only required to tune all adjustable parameters with the convergence analysis. The result of PPD estimator can be utilized for both positive and negative control directions. The control law is established by the estimated PPD and the sliding-reaching condition without any switching term. The convergence of tracking error is theoretically analyzed for the closed-loop system. A numerical example of negative control direction is investigated to verify the effectiveness of PPD estimator and control scheme. The experimental system with the prototype of DC-motor current control is constructed to demonstrate the practicability and performance for the case of positive control direction.

Keywords: Discrete-time systems, Adaptive control, pseudo-partial derivative, Neural networks, DC-motor control.

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