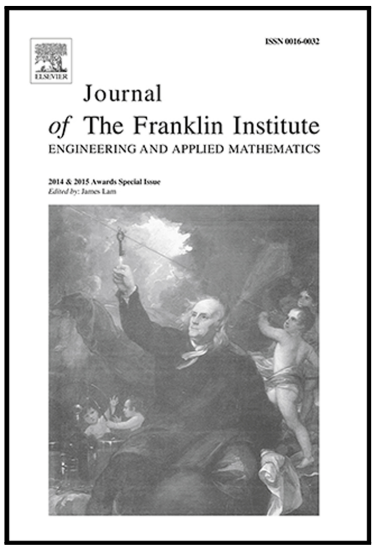

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Data-driven optimal tracking control for discrete-time systems with delays using adaptive dynamic programming

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Abstract

In this paper, the data-driven adaptive dynamic programming (ADP) algorithm is proposed to deal with the optimal tracking problem for the general discrete-time (DT) systems with delays for the first time. The model-free ADP algorithm is presented by using only the system's input, output and the reference trajectory of the finite steps of historical data. First, the augmented state equation is constructed based on the time-delay system and the reference system. Second, a novel data-driven state equation is derived by virtue of the history data composed of input, output and reference trajectory, which is considered as a state estimator. Then, a novel data-driven Bellman equation for the linear quadratic tracking (LQT) problem with delays is deduced. Finally, the data-driven ADP algorithm is designed to solve the LQT problem with delays and does not require any system dynamics. The simulation result demonstrates the validity of the proposed data-driven ADP algorithm in this paper for the LQT problem with delays.

Keywords: Adaptive dynamic programming, Policy iteration, Tracking control, Time-delay, Value iteration

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