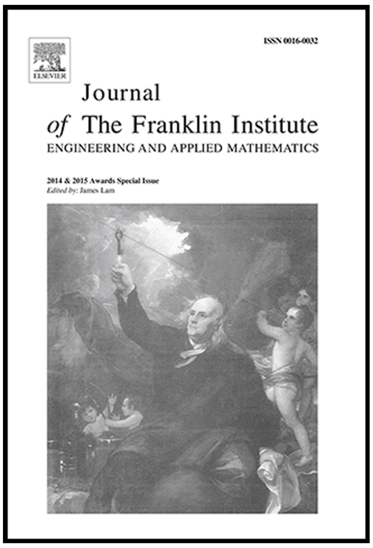

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PII: S0016-0032(17)30310-1
DOI: 10.1016/j.jfranklin.2017.06.017
Reference: FI 3035

To appear in: *Journal of the Franklin Institute*

Received date: 3 October 2016
Revised date: 8 May 2017
Accepted date: 22 June 2017

An integrated data-driven Markov parameters sequence identification and adaptive dynamic programming method to design fault-tolerant optimal tracking control for completely unknown model systems

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Abstract

In this paper, an integrated design of data-driven fault-tolerant tracking control is addressed relying on the Markov parameters sequence identification and adaptive dynamic programming techniques. For the unknown model systems, the sequence of Markov parameters together with the covariance of innovation signal is firstly estimated by least square method. After a transformation of value function from stochastic to deterministic, a policy iteration adaptive dynamic programming algorithm is then formulated to find the optimal tracking control law. In order to eliminate the influence of unpredicted faults, an active fault-tolerant supervisory control strategy is further constructed by synthesizing fault detection, isolation, estimation and compensation. All these involved designs are performed in the data-driven manner, and thus avoid the information requirement about system drift dynamics. From the perspective of system operation management, the above integrated control scheme provides a framework to achieve the tracking performance optimization, monitoring and maintaining simultaneously. The effectiveness of these conclusions is finally verified via two case studies.

Keywords:
data-driven design, fault-compensation-tolerant control, Markov parameters

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