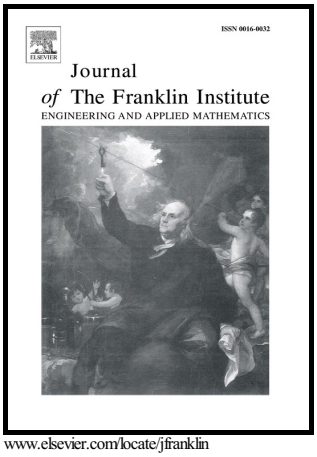

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Robust approximation-free design for tracking and fault tolerance in the presence of arbitrarily switched unknown nonlinearities

Seung Woo Lee,[a], Sung Jin Yoo[a,*]

[a]*School of Electrical and Electronics Engineering, Chung-Ang University, 84 Heukseok-Ro, Dongjak-Gu, Seoul, 156-756 South Korea*

Abstract

This paper presents a robust approximation-free design methodology of tracking problem for a class of uncertain switched nonlinear systems under arbitrary switching. Switched nonlinearities, switched control coefficient functions, and external disturbances are assumed to be unknown. Based on the performance function and the common Lyapunov function method, the common robust approximation-free tracking controller is constructed to ensure that all error surfaces are preserved within the predefined performance bounds and finally converge to a preselected neighborhood of the origin. Then, the fault-tolerant tracking problem of uncertain switched nonlinear systems with faults in both an actuator and switched nonlinearities is addressed without any reconstruction of the proposed control structure. Differing from the existing results in the literature, the proposed control scheme can be implemented without computing repeated time derivatives of certain signals and solving any differential equations for adaptive laws to compensate for unknown nonlinearities and external disturbances, and can guarantee transient performance of the tracking error at the moments when switching or faults occur.

Keywords: Approximation-free, common Lyapunov function, switched nonlinear systems

*Corresponding author.
Email address: sjyoo@cau.ac.kr (Sung Jin Yoo)