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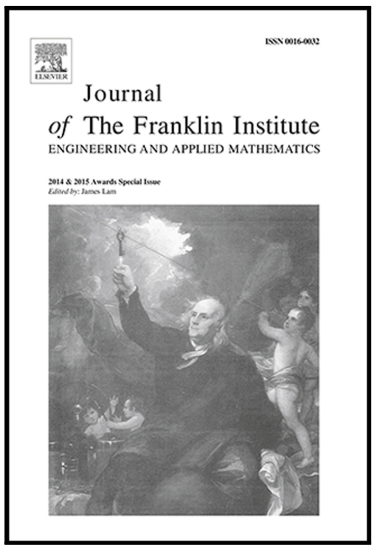

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Observer Design for a Class of Nonlinear Fractional-Order Systems with Unknown Input

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Abstract

A full order fractional-order observer is designed for a class of Lipschitz continuous-time nonlinear fractional-order systems with unknown input. Sufficient conditions of existence for the designed observer and stability of state estimation error system are developed by reconstructing state and using general quadratic Lyapunov function. By applying fractional-order extension of Lyapunov direct method, the stability of the fractional-order state estimation error system is analyzed. Due to the conditions involving a nonlinear matrix inequality, a new sufficient condition with linear matrix inequality (LMI) is reformulated, which makes the full order fractional-order observer implemented easily by using Matlab LMI toolbox. Examples are taken to show the effectiveness of the proposed approach by numerical simulations.

Keywords: Fractional-order observer, quadratic Lyapunov function, Lyapunov direct method, unknown input.

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