Composite Observer Based Output Feedback Control for Multiple Constraints Manipulator

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Abstract

It is a big challenge to control the manipulator, due to disturbances and some unmeasurable states. To alleviate this

challenge, a composite observer based output feedback control method is developed in this paper. It first proposes a composite state/disturbance observer to simultaneously estimate the unmeasurable states and external disturbance. On this basis, a output feedback adaptive control strategy is developed to achieve the desired performance under the multiple constraints, an integral Lyapunov candidate function is used to deal with input dead zone and output saturation . Moreover, the stability of the developed controller is analyzed and proved. Finally, Experiment s on a 2 DOF(degree of freedom)manipulator is used to verify the feasibility of the proposed control method. The results show that the proposed control method can effectively achieve the desirable control performance. Compared with several commonly used control methods, the proposed method shows the superiority.

Full Text

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Figures

Figure 1

Composite state/disturbance observer based multiple-constraint control method

Figure 2

(a) State x_2 estimation and (b) estimation errors

(a)

(b)

Figure 3

(a) State x3 estimation and (b) estimation errors

Figure 4

Estimation of disturbance

Figure 5

Joint control torque

Figure 6

Trajectory tracking performance

Figure 7

Tracking error

Figure 8

Trajectory tracking under different methods

Figure 9

Tracking error under different methods