Direct adaptive backstepping control with tuning functions for a single-link flexible-joint robot

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Abstract : In this paper, direct adaptive backstepping control with tuning functions approach for a single-link flexible-joint robot model is proposed. The proposed approach of adaptation is based on the tracking error based parameter adaptation law. First, the direct adaptive backstepping control with tuning functions is applied for a class of nonlinear systems in parametric strict-feedback form to avoid overparametrization. Next, the main steps of the controller design for a single-link flexible-joint robot manipulator model are described. The stability of the proposed controller is studied by using the Lyapunov functions. Finally, the simulation results are given to demonstrate the performance of the proposed approach.

Keywords : Single-link flexible-joint robot, Backstepping control, direct adaptive control, tuning functions, direct adaptation