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Composite adaptive dynamic surface control of nonlinear systems in parametric strict-feedback form

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Abstract: In this paper, a composite adaptive dynamic surface control scheme is developed for a class of parametric strict-feedback nonlinear systems. The proposed composite adaptation law uses both the surface error and the estimation error to update the parameters. In addition, by using the dynamic surface control technique, the problem of the explosion of complexity in the adaptive backstepping design is avoided. It is proved that the proposed scheme guarantees uniform ultimate boundedness of all signals in the closed-loop system with arbitrary small surface error by adjusting the design parameters. Simulation results demonstrate the effectiveness of the proposed approach for an electrohydraulic actuator system.

Keywords : Composite adaptation law, direct and indirect adaptive control, dynamic surface control, Lyapunov stability, parametric strict-feedback nonlinear systems