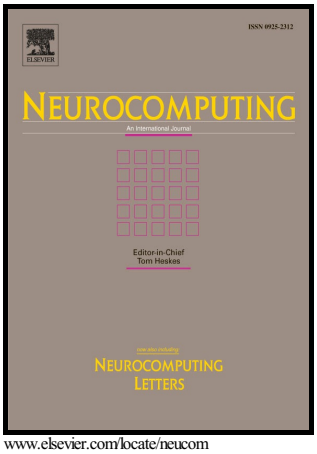

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Adaptive RBFNNs/integral sliding mode control for a quadrotor aircraft

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Abstract

This paper presents a novel hierarchical control strategy based on adaptive radical basis function neural networks (RBFNNs) and double-loop integral sliding mode control (IntSMC) for the position and attitude tracing of quadrotor unmanned aerial vehicles (UAVs) subjected to sustained disturbances and parameter uncertainties. The dynamical motion equations are obtained by the Lagrange-Euler formalism. The proposed controller combines the advantage of the IntSMC with the approximation ability of arbitrary functions ensured by RBFNNs to generate a control law to guarantee the faster convergence of the state variables to their desired values in short time and compensation for the disturbances and uncertainties. Capabilities of online adaptive estimating of the unknown uncertainties and null tracking error are proved by using the Lyapunov stability theory. Simulation results, also compared with traditional PD/IntSMC algorithms and with the backstepping/nonlinear H_∞ controller, verify the effectiveness and robustness of the proposed control laws.

Keywords: Quadrotor aircrafts, adaptive RBFNNs control, double-loop integral sliding mode control, hierarchical control

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