Robust attitude tracking control of small-scale unmanned helicopter.

Summary: Robust attitude control problem for small-scale unmanned helicopters is investigated to improve attitude control performances of roll and pitch channels under both small and large amplitude maneuver flight conditions. The model of the roll or pitch angular dynamics is regarded as a nominal single-input single-output linear system with equivalent disturbances which contain nonlinear uncertainties, coupling-effects, parameter perturbations, and external disturbances. Based on the signal compensation method, a robust controller is designed with two parts: a proportional-derivative controller and a robust compensator. The designed controller is linear and time-invariant, so it can be easily realized. Robust properties of the closed-loop system are proven. According to the ADS-33E-PRF military rotorcraft standard, the controller can achieve top control performances. Experimental results demonstrate the effectiveness of the proposed control strategy.

Keywords: unmanned helicopter; attitude control; robust control; PID control

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