Disturbance rejection for a 2-DOF nonlinear helicopter model by using MIMO fuzzy sliding mode control with boundary layer

ABSTRACT

In this paper, one helicopter model with two degrees of freedom (2-DOF) is controlled by fuzzy sliding mode control with boundary layer (FSMC-BL) while exposed to disturbance. The model is a nonlinear and multi-input multi-output (MIMO) system that requires a MIMO, robust, stable, and nonlinear control to reject the disturbance. These requirements have been satisfied by SMC. In this paper, boundary layer removes the chattering phenomenon and fuzzy logic tunes the switching gains of SMC control law online. The simulation results which are achieved for step and sinusoidal disturbances applied to both pitch and yaw angles, are compared with those of PID control based on linear quadratic regulator algorithm (LQR-PID). Considerable improvement in control signal and yaw angle is observed by using FSMC-BL.