RCMAC-based adaptive control design for brushless DC motors

林志民,許駿飛,鍾招名
Electrical Engineering
Engineering
fei@chu.edu.tw

Abstract

This paper proposes an RCMAC-based adaptive control for brushless DC motors. This control system is composed of a recurrent cerebellar model articulation controller (RCMAC) and a compensation controller. RCMAC is used to mimic an ideal controller, and the compensation controller is designed to compensate for the approximation error between the ideal controller and RCMAC. The Lyapunov stability theory is utilized to derive the parameter tuning algorithm, so that the uniformly ultimately bound stability of the closed-loop system can be achieved. For comparison, a fuzzy control, an adaptive fuzzy control and the developed RCMAC-based adaptive control are implemented on a field programmable gate array (FPGA) chip for controlling a brushless DC motor. Experimental results reveal that the proposed RCMAC-based adaptive control system can achieve the best tracking performance. Moreover, since the developed RCMAC-based adaptive control scheme uses a hyperbolic tangent function to compensate for the approximation error, there is no chattering phenomenon in the control effort. Thus, the proposed control method is more suitable for real-time practical control applications.

Keyword：Recurrent CMAC; Brushless DC motor,