

Adaptive controller design and implementation for a bldc motor drive system

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Abstract

Because of high power density, low maintenance, compactness, and ease of control, the dc brushless (BLDC) motor has been applied, more and more popular in the industry, such as computer, automotive, aerospace, industrial and household, products. Moreover, BLDC motors have advantages of long lifetime, faster response, large power to volume ratio, and low noise as compared with the dc servo motor. According to the signals produced, by the shaft encoder, the switching patterns of the inverter can be determined, in the BLDC motor drive system. Considering the controller design for a BLDC motor drive system, the proportional-integral (PI) controller has been widely used, for a long time due to its simplicity and reliability. Unfortunately, using a fixed PI controller, it is difficult to obtain both a good transient response and a good load disturbance rejection. To solve this problem, an adaptive backstepping controller, which can be a feasible control law for a BLDC motor control system, has been proposed. All the control loops, including the switching strategy and control law, are implemented by a TMS320LF2407A DSP. Several experimental results are shown to validate the theoretical analysis.

Key words: Adaptive backstepping controller; BLDC motor; DSP; Inverter; Shaft encoder