Fuzzy Single-Current Field Weakening Control of IPMSM in EV

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Abstract

Under complex driving conditions, the driving speed of pure electric vehicles changes frequently, and there is no mathematical law to follow. Bad working conditions will lead to the change of the driving motor parameters. Conventional motor control PI regulator parameters are fixed and cannot be adjusted in real time in accordance with the vehicle driving state. The dynamic performance of the drive system decreases due to the increase of AC/DC coupling in the high-speed field weakening region of interior permanent magnet synchronous motor (IPMSM). To solve the above problems, an IPMSM fuzzy single-current field weakening control algorithm for pure electric vehicles was proposed, and the parameters of the PI regulator were adjusted in real time through fuzzy control to enhance the response characteristics and anti-interference characteristics of the drive system. The optimized single-current field weakening control method was adopted, and the a-axis and d-axis voltage was adjusted in real time based on the vehicle speed and the output torque, which enhanced the control performance of the vehicle in the high-speed field weakening region. The feasibility and effectiveness of the proposed control algorithm were verified through a simulation comparison with the conventional PI-adjusted single-current field weakening control algorithm.

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