

Sliding Mode Position Control for Permanent Magnet Synchronous Motors Based on Passivity Approach

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Abstract : In this paper, a sliding mode control method based on the passivity approach is proposed to control the position of surface-mounted permanent magnet synchronous motors (PMSMs). Firstly, the dynamics of a PMSM was proved to be strictly passive. The position controller with an adaptive law was used to estimate the load torque to eliminate the chattering effects associated with the conventional sliding mode controller. The stability analysis of the overall position control system was carried out by adopting the passivity theorem instead of Lyapunov-type arguments. Finally, experimental results were provided to show that the good position tracking can be obtained, and exhibit robustness in the variations of the motor parameters and load torque disturbances.

Keywords : adaptive law, passivity theorem, permanent magnet synchronous motor, sliding mode control

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