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Experimental Implementation of Model Predictive Control for Permanent Magnet Synchronous Motor

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Abstract : Fast speed drives for Permanent Magnet Synchronous Motor (PMSM) is a crucial performance for the electric traction systems. In this paper, PMSM is drived with a Model-based Predictive Control (MPC) technique. Fast speed tracking is achieved through optimization of the DC source utilization using MPC. The technique is based on predicting the optimum voltage vector applied to the driver. Control technique is investigated by comparing to the cascaded PI control based on Space Vector Pulse Width Modulation (SVPWM). MPC and SVPWM-based FOC are implemented with the TMS320F2812 DSP and its power driver circuits. The designed MPC for a PMSM drive is experimentally validated on a laboratory test bench. The performances are compared with those obtained by a conventional PI-based system in order to highlight the improvements, especially regarding speed tracking response.

Keywords : permanent magnet synchronous motor, model-based predictive control, DC source utilization, cascaded PI control, space vector pulse width modulation, TMS320F2812 DSP
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