

FPGA Based Vector Control of PM Motor Using Sliding Mode Observer

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Abstract : The paper presents an investigation of field oriented control strategy of Permanent Magnet Synchronous Motor (PMSM) based on hardware in the loop simulation (HIL) over a wide speed range. A sensorless rotor position estimation using sliding mode observer for permanent magnet synchronous motor is illustrated considering the effects of magnetic saturation between the d and q axes. The cross saturation between d and q axes has been calculated by finite-element analysis. Therefore, the inductance measurement regards the saturation and cross saturation which are used to obtain the suitable id-characteristics in base and flux weakening regions. Real time matrix multiplication in Field Programmable Gate Array (FPGA) using floating point number system is used utilizing Quartus-II environment to develop FPGA designs and then download these designs files into development kit. dSPACE DS1103 is utilized for Pulse Width Modulation (PWM) switching and the controller. The hardware in the loop results conducted to that from the Matlab simulation. Various dynamic conditions have been investigated.

Keywords : magnetic saturation, rotor position estimation, sliding mode observer, hardware in the loop (HIL)

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