Robust sensorless flux and position estimation for SynRMs

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Résumé

We show that the gradient observer proposed in Bernard & Praly, IFAC 2017 for PMSMs, can be used to estimate the stator flux of SynRMs, using only electrical measurements and the knowledge of the resistance. This sensorless observer ensures global convergence of the flux estimate provided the rotation speed and the current norm remains away from zero and the current and voltages are bounded, without requiring the knowledge of the magnetic model. Its robustness with respect to resistance errors is shown, with explicit expression of the resulting steady state error. This observer operates dynamically, in normal conditions, without any constraint on the load, and without any mechanical information. In a second step, we propose to exploit the knowledge of a magnetic inductance model (containing magnetic saturation) to estimate the rotor position from the flux estimate. The performance of this estimation in open-loop are illustrated on experimental data on a SynRM.

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