

Drive Cycle Based Comprehensive Multi-Parameter Estimation Methods

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Program: Electrical Engineering

Level of studies: MASc

Project Description

- To develop advanced parameter estimation techniques to accurately model PMSM
- Must be implementable on lab's electric powertrain tester
- Should be non-invasive by nature

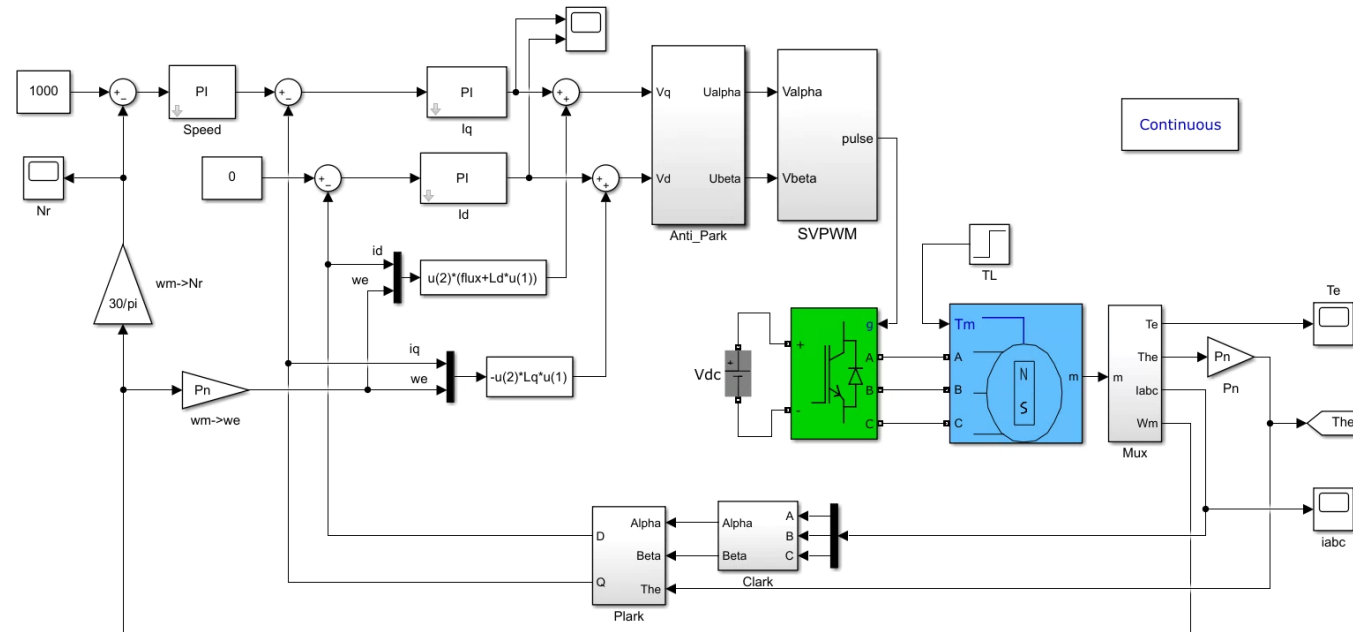


Fig. 1: Simulink model of PMSM Control.

Objective(s)

- Use data collected through drive cycle test to estimate parameters
- Estimate Inductance, PMFL, and Stator Resistance

Tasks/Plan

- Complete Literature Review
- Compare existing test methodologies
- Develop estimation algorithm
- Test the developed method on lab's EPT testbench

Expected Outcome & Deliverables

- Novel test methodology that uses drive cycle data to accurately model the machine parameters
- TcCOM module that will execute test procedure through EPT's PLC



Fig. 1: EPT-150 System.

Progress Report

- Reviewed literature with goal of learning about:
 - Isolation of variables
 - Eliminating sources of error
 - Eliminating effects of non-linearities

References

- [1] Y. Da, X. Shi, and M. Krishnamurthy, "A new approach to fault diagnostics for permanent magnet synchronous machines using electromagnetic signature analysis," IEEE Trans. Power Electron., vol. 28, no. 8, pp. 4104–4112, Aug. 2013.
- [2] K. M. Rahman and S. Hiti, "Identification of machine parameters of a synchronous motor," IEEE Trans. Ind. Appl., vol. 41, no. 2, pp. 557–565, Mar./Apr. 2005.
- [3] -H. P. Nee, L. Lefevre, P. Thelin, and J. Soulard, "Determination of d and q reactances of permanent-magnet synchronous motors without measurements of the rotor position," IEEE Trans. Ind. Appl., vol. 36, no. 5, pp. 1330–1335, Sep./Oct. 2000.
- [4] -E. Armando, R. I. Bojoi, P. Guglielmi, G. Pellegrino, and M. Pastorelli, "Experimental identification of the magnetic model of synchronous machines," IEEE Trans. Ind. Appl., vol. 49, no. 5, pp. 2116–2125, Sep./Oct. 2013

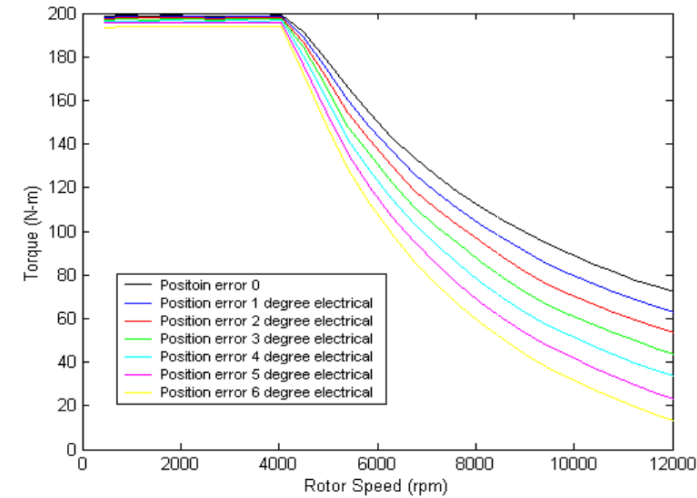


Fig. 3: Effect of position error on torque production in IPM Machine [2].

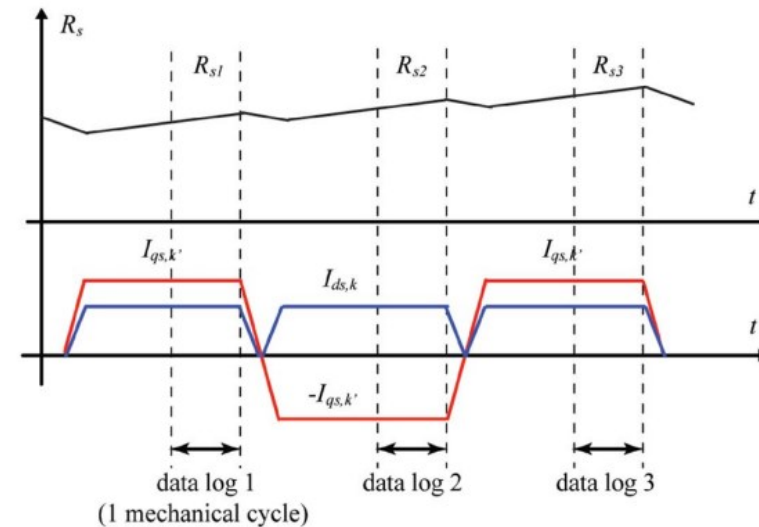


Fig. 4: Three-pulse method of reducing error in R_s [4].