New Book Review, 2015

Authors: S. Ryvkin and E. P. Lever

Title: “Sliding Mode Control for Synchronous Electric Drives”

Publisher: CRC Press, Taylor &Francis Group, 2012, 184 pp

This rather short, but knowledge-dense monograph (or graduate textbook), with strong contributions of authors, especially in terms of sliding mode control theory ,design and implementation, then applied to dc excited, PM and reluctance synchronous motor drives, is very timely and the authors master the subject entirely.

The continual nonlinear synchronous machine behavior, meeting the discrete character of static power converter, is very ingenuously described by the authors via first order sliding mode control with and without motion sensor.

Sliding mode control simplifies control while providing fast torque response, robust to machine parameter detuning and to inertia and load torque perturbations; this makes the book very timely as still Pi and PID control of electric drives dominates the commercial production of variable speed drives, where control robustness is tackled by some kind of adaptation, with refined modeling effort. The merit of the book is to adopt multiple SMC loops (for say, speed and Id, Iq, If in SM drives) and derive conditions for stability related to machine parameters, torque, speed etc.

The book has a strong unitary structure by tackling all aspects of the subject and thus constituting a very pertinent assessment of SMC of SM drives, where even the max efficiency or unity power factor control conditions and shaft elasticity are integrated.

The book contains 7 chapters dealing with all issues of the subject, with Chapter 8 referring to a representative application (200KW oil-pipe underground pump drive) where numerous practical results of authors’ digital simulations are given and discussed pertinently, in detail.

Problem statement (Chapter 1), SM in nonlinear dynamic systems (Chapter 2), state vector estimation (Chapter 3), synchronous drive control design (Chapter 4), multidimensional switching regularization (Chapter 5), mechanical coordinates (state) observers (Chapter 6), digital control (Chapter 7) and practical examples of drive control (Chapter 8) illustrate the myriad of aspects treated in the book, to make it useful to grad. students, faculty and to R&D industrial engineers.

For all the above we warmly recommend this new book to the academic and industry audience interested in robust electric motion/energy control with power electronics interfacing.

Ion Boldea,

IEEE Life Fellow