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# Pragmatic Design Methods Using Adaptive Controller Structures for Mechatronic Applications with Variable Parameters and Working Conditions

- Stefan Preitl
- , Radu-Emil Precup
- , Zsuzsa Preitl
- , Alexandra-Iulia Stînean
- , Claudia-Adina Dragoş
- , Mircea-Bogdan Rădac

## Abstract

This chapter treats two pragmatic design methods for controllers dedicated to mechatronic applications working under variable conditions; for such applications adaptive structures of the control algorithms are of great interest. Basically, the design is based on two extensions of the modulus optimum method and of the symmetrical optimum method (SO-m): the Extended SO-m and the double parameterization of the SO-m (2p-SO-m). Both methods are introduced by the authors and they use PI(D) controllers that can ensure high control performance: increased value of the phase margin, improved tracking performance, and efficient disturbance rejection. A short systematic presentation of the methods and digital implementation aspects using adaptive structure of the algorithms for industrial applications are given. The chapter deals with a cascade speed control structure for a driving system with continuously variable parameters, i.e., electrical drives with variable reference input, variable moment of inertia and variable disturbance input.

*“The PID controller can be said to be ‘the bread and the butter’ of the control engineering”.*

(K.-J. Åström)

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- [Mircea-Bogdan Rădac](#)<sup>(3)</sup>

## Author Affiliations

- 3. Department of Automation and Applied Informatics, “Politehnica” University of Timisoara, Bd. V. Parvan 2, 300223, Timisoara, Romania
- 4. Siemens A.G., Erlangen, Germany

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