

CONTROL OF DETERMINISTIC AND STOCHASTIC SYSTEMS WITH SEVERAL SMALL PARAMETERS – A SURVEY*

Hiroaki Mukaidani[†] Vasile Dragan[‡]

Abstract

The past three decades of research on multiparameter singularly perturbed systems are reviewed, including recent results. Particular attention is paid to stability analysis, control, filtering problems and dynamic games. First, a parameter-independent design methodology is summarized, which employs a two-time-scale and descriptor systems approach without information on the small parameters. Further, various computational algorithms are included to avoid ill-conditioned systems: the exact slow-fast decomposition method, the recursive algorithm and Newton's method are considered in particular. Convergence results are presented and the existence and uniqueness of the solutions are discussed. Second, the new results obtained via the stochastic approach are presented. Finally, the results of a simulation of a practical power system are presented to validate the efficiency of the considered design methods.

keywords: Singular perturbations, several small parameters, deterministic systems, stochastic systems, robust control, Nash games.

*Accepted for publication in revised form on 17.05.2009

[†]mukaida@hiroshima-u.ac.jp Graduate School of Education, Hiroshima University, 1-1-1 Kagamiyama, Higashihiroshima, 739-8524 Japan. Fax: +81-82-424-7155

[‡]Institute of Mathematics of the Romanian Academy, P.O. Box 1-764, Ro-70700, Bucharest, Romania.