

Performance Guarantees in Dual Control using Gain Scheduling *

Janani Venkatasubramanian * Johannes Köhler *
Julian Berberich * Frank Allgöwer *

* *Institute for Systems Theory and Automatic Control, University of
Stuttgart, 70569 Stuttgart, Germany (email:
{janani.venkatasubramanian, johannes.koehler, julian.berberich,
frank.allgower}@ist.uni-stuttgart.de).*

Abstract: We present a novel strategy for robust dual control of linear time-invariant systems based on gain scheduling with performance guarantees. This work relies on prior results of determining uncertainty bounds of system parameters estimated through exploration. Existing approaches are unable to account for changes in the mean of system parameters in the exploration phase. We address this limitation by selecting the future (uncertain) mean as a scheduling variable in the control design. This results in a single semi-definite program that computes a suitable exploration strategy and a robust gain-scheduled controller.

Keywords: Learning for control, Identification for control, Closed loop identification

* The authors thank the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) for financial support of the project within the Cluster of Excellence in Simulation Technology (EXC 2075 - 390740016) at the University of Stuttgart, and the International Research Training Group Soft Tissue Robotics (GRK 2198/1). The authors thank the International Max Planck Research School for Intelligent Systems (IMPRS-IS) for supporting Janani Venkatasubramanian and Julian Berberich.