Minisymposium on

# Robust Variable-Structure Approaches for
# Control and Estimation of Uncertain Dynamic Processes

at ECMI 2014 (European Conference for Mathematics in Industry)
Taormina, Sicily, Italy
9–13 June 2014

Organizers: Andreas Rauh and Luise Senkel

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In recent years, numerous variable-structure approaches have been developed for control of nonlinear dynamic systems and for the model-based estimation of non-measurable states and parameters. These approaches typically make use of first-order as well as higher-order sliding mode techniques and related procedures. One of their main advantages is the inherent proof of asymptotic stability. This stability proof is either performed offline during the corresponding controller as well as estimator design or online by the real-time evaluation of a suitable candidate for a Lyapunov function.

The methodological framework for variable-structure control and estimation approaches is quite well developed in the case of systems, for which process models are accurately known. Nevertheless, research efforts are still necessary to make the corresponding procedures applicable when only worst-case bounds are available for specific parameters (e.g. due to non-negligible manufacturing tolerances). Moreover, significant stochastic disturbances (e.g. as a result of measurement noise) may act as further system inputs in such applications. To enhance robustness in such cases, it is possible to combine techniques which are for instance based on interval analysis, stochastic differential equations, or linear matrix inequalities with variable-structure approaches.

This Minisymposium aims at presenting current research activities in the field of robust variable-structure control. The scope equally consists in highlighting novel methodological aspects as well as in presenting the use of variable-structure techniques in industrial applications including their efficient (software) implementation on hardware for real-time control.

*Possible contributions to this Minisymposium may contain*

- Higher-order sliding mode techniques for control and estimation in continuous-time and discrete-time systems

- Interval analysis for stability and reachability analysis

- Stability analysis for finite-dimensional dynamic systems with bounded uncertainty

- Stability analysis for dynamic systems described by stochastic differential equations

- Lyapunov techniques for variable structure systems (including hybrid and switched dynamics)

- Linear matrix inequality techniques for robust control and estimation

- Numerical verification, robustness and sensitivity analysis

- Experimental validation of variable structure techniques

**Deadlines/ Further information:**

- ~~Oct. 20, 2013:~~ Final extension: Oct. 28, 2013: Submission of tentative presentation titles to A. Rauh and L. Senkel (`{Andreas.Rauh,Luise.Senkel}@uni-rostock.de`)

- Nov. 30, 2013: Submission of abstract (100 words) to A. Rauh and L. Senkel

- Further deadlines concerning extended abstract submission and deadlines for full papers will be provided after approval of the Minisymposium by the conference organizers

- A publication of extended versions of the Minisymposium papers is planned as a Special Issue of a high-quality peer-reviewed journal

- Conference web page: `http://www.taosciences.it/ecmi2014/`