

Part I

Sliding Mode Control for Continuous and Discrete-Time Systems

In the first part of this book, scientific works are presented which focus on solving control tasks for nonlinear and uncertain dynamic systems by the application as well as the novel development of sliding mode control techniques. In Chap. 1, Saif Siddique Butt, Hao Sun, and Harald Aschemann describe a comparison of backstepping-based sliding mode techniques and adaptive backstepping approaches for the design of robust controllers of a twin rotor helicopter. In contrast to the continuous-time design in the first chapter, Chap. 2 authored by Piotr Leśniewski and Andrzej Bartoszewicz deals with the robust, discrete-time congestion controller design for a single virtual circuit in connection-oriented communication networks. Andreas Rauh and Luise Senkel develop and implement novel interval methods for the robust sliding mode control synthesis of high-temperature fuel cells. Besides the influence of uncertain but bounded parameters and disturbances, the handling of state and input constraints is explicitly addressed in this Chap. 3. Further methodological extensions of interval-based sliding mode controllers are presented in Chap. 4 by Luise Senkel, Andreas Rauh, and Harald Aschemann. It deals with the experimental and numerical validation of a reliable sliding mode control strategy considering uncertainty with the help of interval arithmetic in a real-time capable implementation.