

Lars Grüne (lars.gruene@uni-bayreuth.de), University of Bayreuth, Germany, *Qualitative and Quantitative Aspects of the Input–To–State Stability Property*

In this talk we present results on the input–to–state stability (ISS) property for nonlinear perturbed systems. In the first part, we investigate the qualitative nature of this property. The main result is a theorem obtained together with E. Sontag and F. Wirth, which states that the ISS property is equivalent to the nonlinear H_∞ property under suitable nonlinear changes of coordinates.

In the second part we focus on quantitative aspects of ISS. We introduce a variant of ISS, called input–to–state dynamical stability (ISDS), which utilizes a 1d dynamical system in order to describe the decay both of large initial values and of past disturbances. Here the main result is that ISDS allows for a gain preserving Lyapunov function characterization which in particular allows to give estimates for the ISDS (and ISS) robustness gain. As applications we consider a quantitative version of a nonlinear small gain theorem and results from numerical stability analysis.