

Einladung zum Vortrag

von Herrn A. Pogromskyi (Eindhoven University of Technology) zum Thema

Comprehending complexity: where Shannon meets Lyapunov

am Donnerstag, 09.11.2017, um 13:00 Uhr, in Raum (IM) SR 040

Abstract

One of the fundamental issues in the rapidly emerging area of control of networked systems is about constraints on communication among the network agents. Some key aspects of such constraints are commonly modeled based on a concept of communication channel with a limited data transmission rate. In this framework, a primary inquiry is about the minimal rate needed to achieve a desired control and/or estimation objective.

This data-rate threshold has appeared to be alike in spirit to the topological entropy of the system at hands, but is not always identical. A feasible computation or even fine estimation of these thresholds is an intricate matter for nonlinear systems and especially for networks of interconnected nonlinear systems. For such networks those quantities can serve as upper bounds on the rate at which the system generates information - the quantity which itself can serve as a measure of complexity for networks of interconnected systems.

The talk focuses on observation of nonlinear and deterministic, though maybe chaotic, systems (or networks) via finite capacity communication channels. The information about the state of the system has to be encoded and transmitted digitally via the channel to a remote peer, and then decoded in such a way that the remote peer becomes aware of the system state with some acceptable accuracy. Different notions of observability with corresponding data rate thresholds are introduced. The main direction of the research is to provide tractable estimates for such thresholds. The lower estimate is derived via the first Lyapunov method, while the upper estimate is based on the second Lyapunov method. A number of examples based on celebrated chaotic systems are considered.