



DIPARTIMENTO DI INGEGNERIA DELL'ENERGIA ELETTRICA
E DELL'INFORMAZIONE "GUGLIELMO MARCONI"

Seminar notice

Feedback system analysis: back to the future

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Abstract

Feedback system analysis is the backbone of control theory. While the theory was originally developed in an input-output framework, as an offspring of circuit theory, the state-space formalism has become dominant under the drive of robotics, and, more recently, machine learning. Dissipativity theory has played a crucial role in bridging the two approaches, using state-space representations to make the input output theory algorithmic, at least in the special case of linear time-invariant (LTI) systems.

The talk will reflect on the fact that the focus of the input-output theory was on incremental system properties (e.g. incremental gain) whereas the focus of state-space theory is on non-incremental properties. We will discuss why the analysis of incremental properties has disappeared from state-space theory and why this limitation has become a key bottleneck of nonlinear control. Finally, we will report on current research avenues to bypass state-space representations in an algorithmic input-output analysis of incremental system properties.

Venue: Room 0.2

School of Engineering, University of Bologna, Viale del Risorgimento 2, Bologna

Date: Friday October 14, 15.00-16.00

Biography: Rodolphe Sepulchre received the engineering degree (1990) and the PhD degree (1994), both from the Université catholique de Louvain, Belgium. He was a postdoctoral research associate at the University of California, Santa Barbara, from 1994 to 1996. He was then appointed at the Université de Liège in 1997. In 2013, he moved to Cambridge, UK, where he holds the control chair in the Department of Engineering and a professional fellowship in Sidney Sussex College. He held visiting positions at Princeton University (2002-2003), the Ecole des Mines de Paris (2009-2010), California Institute of Technology (2018), and part-time positions at the University of Louvain (2000-2011) and at INRIA Lille Europe (2012-2013). He was the Petar Kokotovic Distinguished Visiting Professor of UCSB in 2019.

He is a fellow of IFAC (2020), IEEE (2009), and SIAM (2015). In 2008, he received the IEEE Control Systems Society Antonio Ruberti Young Researcher Prize. He was elected at the Royal Academy of Belgium in 2013. He is the recipient of the 2020 IEEE Axelby Best Paper Award. He is (co-) author of the monographs Constructive Nonlinear Control (1997, with M. Jankovic and P. Kokotovic) and Optimization on Matrix Manifolds (2008, with P.-A. Absil and R. Mahony). His research is currently funded by the ERC advanced grant SpikyControl. He is Editor-in-Chief of the IEEE Control Systems Magazine since 2020.

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