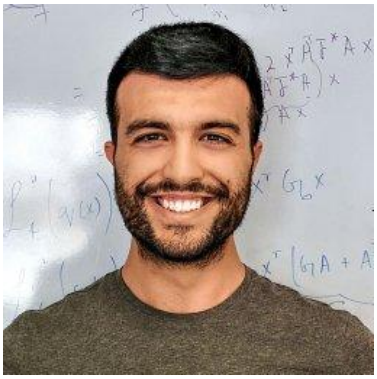
SEMINAR SERIES

北京大学工学院 力学与工程科学系

湍流与复杂系统国家重点实验室

Stability of Nonlinear Monotone Systems with Applications to Multi-Agent Networks and Recurrent Neural Networks



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主持人：李忠奎 孙志勇

时 间：5 月 30 日（周五）上午 09:30

地 点：新奥工学大楼 1008 会议室

Abstract:

In this talk we discuss the case of a network of agents modeled by nonlinear discrete-time dynamical systems, whose asymptotic behavior is fully described by a map assumed to be (type-K) monotone and plus-homogeneous, which are the nonlinear counterpart of nonnegativity (with positive diagonal) and row-stochasticity, respectively. The key findings are as follows: 1.We prove that nonlinear discrete-time dynamical system whose map is type-K monotone and plus-homogeneous asymptotically converges to a fixed point of the map, or equivalently, to an equilibrium point of the system, if any exists; 2.We derive necessary and sufficient conditions on the local agents' dynamics and their reciprocal interaction in order to guarantee that the interconnected system falls into the above-mentioned class; 3.We provide the link between the above result and graph theory by proving that the existence of a globally reachable node in the communication network is sufficient to restrict the set of equilibrium points to those of consensus; The literature of nonlinear MASs mostly consists of ad-hoc solutions based on Lyapunov theory. In contrast, the innovative aspect of our approach is that it provides stability results and convergence to consensus as a special case without the need of exploiting Lyapunov theory.

Bio

Diego Deplano is Assistant Professor (RTD-A) at the Department of Electrical and Electronic Engineering, University of Cagliari, Italy. He received the B.S., M.S., and PhD degrees in Electronic Engineering "cum laude" from the University of Cagliari, Italy, respectively in '15, '17, and '21. He was awarded the best PhD Thesis defended in the area of Systems and Control Engineering at an Italian University by SIDRA. He spent visiting periods at the Nanyang Technological University (NTU), Singapore, at the Centre National de la Recherche Scientifique (CNRS), Grenoble, France, and at the University of Toronto (UofT), Toronto, Canada. His research interests include nonlinear multi-agent systems, consensus problems, distributed estimation, positive systems, and mobile robotics

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