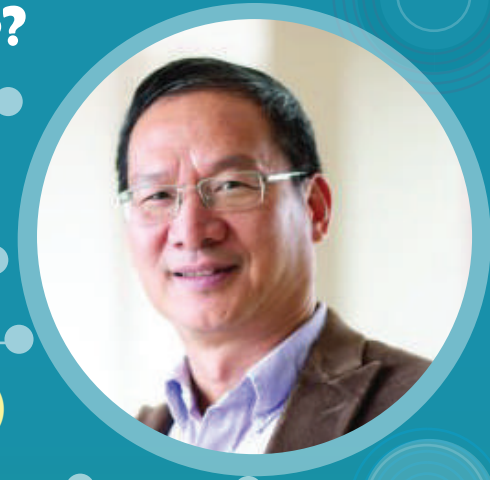


When Are Nonlinear Systems Semiglobally Asymptotically Stabilizable by Sampled-Data Feedback?

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Date: 19 December 2023 (Tuesday)
Time: 2:00 pm
Venue: B5-307 (Blue Zone), 5/F,
Yeung Kin Man Acad Building

Abstract

Most of the existing results in the literature over the past two decades were devoted to semiglobal practical stabilization of nonlinear systems by sampled-data feedback and few results are available on semiglobal asymptotic stabilization, due to the nature of “sample and hold” and the resulting hybrid closed-loop system. In this talk, we present recent advances in semiglobal asymptotic control of general nonlinear systems by sampled-data feedback. For MIMO nonlinear systems, we prove that while global asymptotic stabilizability (GAS) may not ensure either global or semiglobal asymptotic stabilizability (SGAS) by sampled-data state feedback, global asymptotic local exponential stabilizability (GALES) does imply the existence of a SGAS sampled-data state feedback controller.

Based on this state feedback result, we further present the main contribution of this talk: GALES and uniform observability imply semi-global asymptotic stabilizability by sampled-data output feedback, which is indeed a sampled-data version of the “separation principle” for nonlinear systems. The development of the “digital separation principle” is made possible by employing a subtle Lyapunov argument that makes the estimation of domains of attraction and semiglobal asymptotic analysis intuitive and simple, without involving intricate Lyapunov functions and the corresponding level sets. Examples and results on SGAS by sampled-data feedback for representative classes of nonlinear systems are also given as illustrations.

Biography

Wei Lin received the D.Sc. and M.S. degrees in Systems Science and Mathematics from Washington University, St. Louis, in 1993 and 1991. He also received the B.S. and M.S. degrees in Electrical Engineering from Dalian University of Technology (1983) and Huazhong University of Science and Technology (1986), respectively. During 1986 to 1989, he was a Lecturer in the Dept. of Mathematics at Fudan University, Shanghai, China. From 1994 to 1995, he was a post-doctor and Visiting Assistant Professor in Washington University. Since spring of 1996, he has been a Professor in the Dept. of Electrical, Computer, and Systems Engineering at Case Western Reserve University, Cleveland, Ohio.

Prof. Lin's research interests include nonlinear control, dynamic systems with time-delay, homogeneous systems theory, estimation and adaptive control, stochastic control and stochastic stability, under-actuated mechanical systems and robotics, power systems, renewable energy and smart grids. In these areas, he has published a number of papers in peer-referenced journals and conferences.

All are welcome

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