New Stability Results in Nonlinear Time-Varying Systems with Control Applications

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Abstract
In this talk I will report some new stability results in nonlineartime-varying systems obtained in a series of our recent work. Motivated by emerging control applications in underactuated mechanical systems, we ask ourselves the following questions: (1) What are the new, practically applicable tests for uniform local and global stability in generalnonlinear time-varying systems? (2) How to generalize the celebrated Krasovkii-LaSalle Theorem to more general time-varying systems? Uniform asymptotic stability is a nice property which often cannot be derived using the existing powerful tools such as Barbalat lemma and LaSalle Invariance Principle. Our research has resulted in several new stability criteria which not only address this problem but also lead to novel solutions to the robust regulation and tracking problem for nonholonomic mobile robots.

Biography
Z.P. JIANG received the B.Sc. degree in mathematics from the University of Wuhan, Wuhan, China, in 1988, the M.Sc. degree in statistics from the Université de Paris-sud, France, in 1989, and the Ph.D. degree in automatic control and mathematics from the École des Mines de Paris, France, in 1993.

From 1993 to 1998, he held visiting researcher positions with various institutions including INRIA (Sophia-Antipolis), France, the Australian National University, the University of Sydney, and University of California. Currently he is a Professor of Electrical and Computer Engineering at the Polytechnic Institute of New York University (formerly called Polytechnic University because the latter has entered into a merge agreement with NYU since July 1, 2008). His main research interests include stability theory, the theory of robust and adaptive nonlinear control, and their applications to underactuated mechanical systems, congestion control, wireless networks, multi-agent systems and cognitive science.

Dr. Jiang has served as a Subject Editor for the *International Journal of Robust and Nonlinear Control,* and as an Associate Editor for *Systems & Control Letters*, *IEEE Transactions on Automatic Control* and *European Journal of Control*. Dr. Jiang is a recipient of the prestigious Queen Elizabeth II Fellowship Award from the Australian Research Council, the CAREER Award from the U.S. National Science Foundation, and the Young Investigator Award from the NSF of China. He (together with coauthor Yuan Wang) received the Best Theoretic Paper Award at the *2008 World Congress on Intelligent Control and Automation*, June 2008, for the paper "A Generalization of the Nonlinear Small-Gain Theorem for Large-Scale Complex Systems".
Dr. Jiang is a Fellow of the IEEE.