Cymer Center for Control Systems and Dynamics

Hybrid dynamical systems: robust stability and control

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Hybrid dynamical systems are those with state variables that can both flow and jump. These systems can model mechanical systems with impacts, continuous-time control systems that employ logic variables, and biological systems with impulsive effects. Hybrid systems have been studied in the literature for at least forty years, with a renewed intensity over the last two decades that correlates with an increasing prevalence of embedded control systems.

This talk revolves around a modeling framework for hybrid dynamical systems that lends itself naturally to robustness properties, which are crucial for the development of successful hybrid control systems. This framework enables many classical stability analysis tools to be extended to the hybrid setting. A brief overview of these tools will be presented and connected to hybrid feedback control design.

Andrew R. Teel received his A.B. degree in Engineering Sciences from Dartmouth College in Hanover, New Hampshire, in 1987, and his M.S. and Ph.D. degrees in Electrical Engineering from the University of California, Berkeley, in 1989 and 1992, respectively. After receiving his Ph.D., he was a postdoctoral fellow at the Ecole des Mines de Paris in Fontainebleau, France. In 1992 he joined the faculty of the Electrical Engineering Department at the University of Minnesota, where he was an assistant professor until 1997. Subsequently, he joined the faculty of the Electrical and Computer Engineering Department at the University of California, Santa Barbara, where he is currently a professor. His research interests are in nonlinear and hybrid dynamical systems, with a focus on stability analysis and control design. He has received NSF Research Initiation and CAREER Awards, the 1998 IEEE Leon K. Kirchmayer Prize Paper Award, the 1998 George S. Axelby Outstanding Paper Award, and was the recipient of the first SIAM Control and Systems Theory Prize in 1998. He was also the recipient of the 1999 Donald P. Eckman Award and the 2001 O. Hugo Schuck Best Paper Award, both given by the American Automatic Control Council. He is a Fellow of the IEEE.