The Hong Kong Polytechnic University
Department of Applied Mathematics

Seminar

Invariance Principle for Hybrid Dynamical Systems with Applications to Epidemic Models

By

Prof. Xinzhi LIU
University of Waterloo

Abstract

There has been a growing interest in hybrid dynamical systems in recent years. Such systems often undergo vector field switching and/or state jumps due to sudden changes in model characteristics. By introducing the notions of persistent limit set and persistent mode, we extend the classical LaSalle's invariance principle to hybrid systems exhibiting both impulses and switching. A weak invariance principle is established for such systems, under a weak dwell-time condition on the impulsive and switching signals. This weak invariance principle is then applied to derive asymptotic stability criteria for impulsive switched systems. As an application, we investigate a switched SEIR epidemic model with pulse treatment and establish sufficient conditions for the global asymptotic stability of the disease-free solution under weak dwell-time signals.

Biography

Xinzhi Liu received the B.Sc. degree in mathematics from Shandong Normal University, Jinan, China, in1982, and the Ph.D. degrees in applied mathematics from University of Texas, Arlington, in 1988. He was a Post-Doctoral Fellow at the University of Alberta from 1988 to 1990. He joined the Department of Applied Mathematics, University of Waterloo, Waterloo, Ontario, Canada, as an Assistant Professor in 1990, where he became an Associate Professor and a Full Professor in 1994 and 1997 respectively. His research areas include dynamical systems and differential equations with applications in control, neural networks, epidemic models, and communication. He is the author or coauthor of over 400 research articles and 6 research monographs.

Date: 4 May 2023 (Thursday)
Time: 10:00-11:00 (Hong Kong Standard Time GMT +8)
Venue: TU101 (Hybrid mode)
Meeting ID: 996 2299 3853 (Passcode: 0504)
Speaker: Prof. Xinzhi Liu, University of Waterloo
Host: Dr. Yijun Lou, The Hong Kong Polytechnic University
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