数学与系统科学研究院学术报告

报告题目：PE Condition and the Parameter Convergence of the Adaptive Control of Nonlinear Systems

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摘要:

PE (Persistency of Excitation} is a well known condition in adaptive control of linear systems. This condition guarantees exponential convergence to zero of the estimation error of some unknown parameter vector in the system. This is result is established by applying a quadratic Lyapunov function to the closed-loop system. Under the PE condition, the closed-loop system is exponentially stable. As the estimation error is part of the state vector of the closed-loop system, the PE condition guarantees that the unknown parameter will converge to the true parameter exponentially.

In the literature of adaptive control of nonlinear systems, the parameter convergence has long been an open issue. Recently, there are some claims on the parameter convergence issue associated with the adaptive control of nonlinear systems. These claims ascertain that PE condition also guarantees the parameter convergence for nonlinear adaptive control systems. However, these claims are either unproved or proved with faults. In this talk, we tackle the parameter convergence issue associated with the adaptive control of nonlinear system without resorting to the Lyapunov argument. It is shown that the PE condition still works for nonlinear systems. Also, it is shown that when it comes to adaptive control of output regulation problem of nonlinear systems, the PE condition is guaranteed to be satisfied if the dimension of the internal model is minimal in some sense. The talk will be closed with some remarks.

报告人简介:

Jie Huang obtained his Ph.D. degree from Johns Hopkins University in 1990. He was a postdoctoral fellow at Johns Hopkins University from September 1990 to July 1991. From August 1991 to August 1995, he worked in industry in USA. He joined the Chinese University of Hong Kong in Department of Mechanical and Automation Engineering, and is now a professor. His research interests include nonlinear control theory and applications, robust control, adaptive control, and guidance and control of flight vehicles.