



## *colloquia@iasi*



*"La mente è come un paracadute.  
Funziona solo se si apre"  
A. Einstein*

### **A Methodology for Establishing Stability of Interconnected Dissipative and Integral Input-to-State Stable Systems**

Prof. **Hiroshi Ito**

*Department of Systems Innovation and Informatics, Kyushu Institute of Technology, Japan*

#### Abstract

In this seminar, I will talk about the problem of verifying stability properties of interconnected dissipative nonlinear systems. I will first introduce a unified mathematical formulation whose solutions explicitly provide Lyapunov functions establishing dissipative properties of the interconnected systems. This talk discusses not only formal applicability of the formulation to general systems, but also demonstrates substantial effectiveness in determining stability involving nonlinearities stronger than ones covered by previously existing stability theorems. In particular, interconnections of integral input-to-state stable systems are targeted, and a small-gain condition under which a Lyapunov function can be constructed explicitly is presented. Classical stability criteria and the popular ISS small-gain theorem are explained as special cases in the same language. The necessity of the small-gain criterion for the stability of interconnections is also addressed. If time allows, I will briefly sketch a recent result on the stability criterion for networks of integral input-to-state stable systems without any assumption on the network structure.