電機系 DEPARTMENT OF ELECTRICAL ENGINEERING

Nonlinear System and Signal Laboratory

- **Lab Feature：** The Nonlinear System and Signal Lab investigates the theory of nonlinear system and its applications. On the theoretical part, the stability analysis of complex systems is our main target (see Fig. 2). The scope includes the convergence analysis of switched, hybrid (see Fig. 1) and time delay systems, and the modeling of signal sets defined on time scales. Some obtained results have been applied to the stability analysis of inverter, the consensus control of multi-agent systems, and the tracking (and regulation) control of nonholonomic mechanical systems. The future research direction will focus on quantum control, artificial intelligence and big data, where control technique will play an important role.

Research Topics

- Modeling and stability analysis of signal set defined on time scales
- Modeling and control of switched and hybrid systems
- Consensus and formation control of multi-agent systems
- Tracking control of nonholonomic mechanical systems
- Quantum control
- Big data and artificial intelligence

Referred Papers

- T. C. Lee, Y. Tan and I. Mareels, "Detectability and uniform global asymptotic stability in switched nonlinear time-varying systems," *IEEE Trans. Automat. Contr*., No. 5, pp. 2123-2138, 2020.
- T. C. Lee, W. Xia, Y. Su and J. Huang, "Exponential consensus of discrete-time systems based on a novel Krasovskii–LaSalle theorem under directed switching networks," *Automatica*, No. 11, pp. 189 - 199, 2018.
- T. C. Lee, Y. Tan and I. Mareels, "Analyzing the stability of switched systems using common zeroing-output systems," *IEEE Trans. Automat. Contr*., No. 10, pp. 5138 - 5153, 2017.
- T. C. Lee, Y. Tan and D. Nešić, "Stability and persistent excitation in signal sets," *IEEE Trans. Automat. Contr*., No. 5, pp. 1188-1203, 2015.

Selected Grants

- Generalized Invariance Principles with Applications - MOST-109-2221-E-110 -078 -MY3 (2020~2023)
- Stability of Signal Set on Time Scale with Applications - MOST-108-2221-E-110 -080 -MY3 (2019~2022)
- Generalized detectability conditions of complex systems and their Applications -MOST-106-2221-E-159-001-MY2 (2017~2019)
- Generalized detectability conditions in signal sets with applications - MOST-105-2221-E-159 -005 (2016)

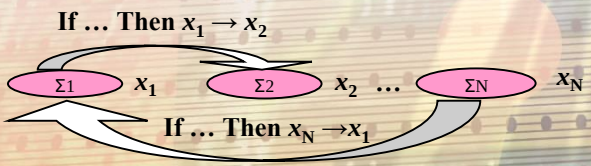

Fig.1: Architecture of hybrid and switched systems

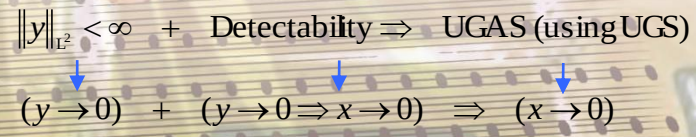

Fig.2: Architecture of the proposed tools for stabilization

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