Modeling, Control and Filtering of Multi-Time-Scale Dynamical Systems Based on fuzzy singularly perturbed models

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Abstract: In this talk, a fuzzy singularly perturbed model is proposed for the modeling, control and filtering of a class of multi-time-scale dynamical systems, such as semiconductor packaging processes, multi-link (joint) flexible manipulators and large scale flexible space structure. The variant expands the idea from Takagi-Sugeno type fuzzy system that the dynamics of a class of distributed parameter systems can be approximated by softly merging locally linear singularly perturbed model, and an increased partition of fuzzy space will lead to a more precise approximation. As a result, the control problem for multi-time scale dynamical systems can be reduced to that for fuzzy singularly perturbed system so that plentiful of theoretical results are hopefully obtained.

Main achievements in this field will be reported, which are carried out in my research group at National Lab of Information Science and Technology of Tsinghua University. These researches include fuzzy singularly perturbed model (FSPM), its universal approximation, controller synthesis and filtering for discrete-time and continuous-time multi-time-scale dynamical systems.