MAX-PLANCK-INSTITUT
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CSC Seminar

SPEAKER

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TITLE

Frequency-dependent Switching Control for Disturbance Attenuation of Linear Systems

ABSTRACT

The generalized Kalman–Yakubovich–Popov lemma as established by Iwasaki and Hara in 2005 marks a milestone in the analysis and synthesis of linear systems from a finite-frequency perspective. Given a pre-specified frequency band, it allows us to produce passive controllers with excellent in-band disturbance attenuation performance at the expense of some of the out-of-band performance. This paper focuses on control design of linear systems in the presence of disturbances with non-strictly or non-stationary limited frequency spectrum. We first propose a class of frequency-dependent excited energy functions (FD-EEF) as well as frequency-dependent excited power functions (FD-EPF), which possess a desirable frequency selectiveness property with regard to the in-band and out-of-band excited energy as well as excited power of the system. Based upon a group of frequency-selective passive controllers, we then develop a frequency dependent switching control (FDSC) scheme that selects the most appropriate controller at runtime. We show that our FDSC scheme is capable to approximate the solid in-band performance while maintaining acceptable out-of-band performance with regard to global time horizons as well as localized time horizons. The method is illustrated by a commonly used aircraft benchmark model.

Tuesday, May 23, 2023 at 2 pm
seminar room Prigogine