

# TP06

## Linear Control

13:30-15:30

Room : 1st Floor-Brahms

Chair1 : Jong Hae Kim ( Sunmoon Univ., Korea )

Chair2 :

13:30 – 13:50

TP06-1

### Guaranteed cost control for singular systems with time delays using LMI

Jong Hae Kim(Sunmoon Univ., KOREA)

This paper is concerned with the problem of designing a guaranteed cost state feedback controller for singular systems with time-varying delays. The sufficient condition for the existence of a guaranteed cost controller, the controller design method, and the optimization problem to get the upper bound of guaranteed cost function are proposed by LMI(linear matrix inequality), singular value decomposition, Schur complements, and change of variables. Since the obtained sufficient conditions can be changed to LMI form, all solutions including controller gain and upper bound of guaranteed cost function can be obtained simultaneously.

13:50 – 14:10

TP06-2

### Output-feedback $H_\infty$ Control of Discrete-time LPV Systems

Doo Jin Choi, PooGyeon Park(POSTECH, KOREA)

- We propose a new  $H_\infty$  LPV output-feedback controller associated with a new PQLF
- The LPV controller employs not only the current-time but also the one-step-past information
- The controller is formulated with parameterized linear matrix inequalities
- We propose the new controller for discrete-time LPV systems
- As a conservative case, we suggest another controller associated with CQLF

14:10 – 14:30

TP06-3

### Eigenstructure-Based Robust Stability Criterion for Linear Time-Varying Systems

Ho Chul Lee, Jae Weon Choi(Pusan Nat'l Univ., KOREA)

Stability robustness of a linear time-varying system with time-varying structured state space uncertainties is considered by using extended-mean theorem and Bellman's lemma. The extended-mean theorem is a necessary and sufficient exponential stability criterion based on the recently developed PD-eigenvalue and PD-eigenvector for a linear time-varying system. Our new result required that the extended-mean of each nominal PD-eigenvalue should be negative real which is determined by a norm involving the structures of the uncertainty and the no...

14:30 – 14:50

TP06-4

### A Study on the Effects of Added Zeros to the System with a Monotone Nondecreasing Step Response.

Byung-Moon Kwon(KARI, KOREA), Hyun-Seok Lee, Oh-Kyu Kwon(Inha Univ., KOREA)

This paper investigates some conditions such that zeros are added to the system with a monotone nondecreasing step response in order to hold the monotonicity as before. Two conditions are presented for the cases that a real zero and complex conjugate zeros are added to the system satisfying the monotonicity condition, respectively. To exemplify the proposed results, some simple examples via computer simulation are shown in this paper. Proposed conditions can be easily used in the control system design since they are only formulated in terms of pole-zero configurations.

14:50 – 15:10

TP06-5

### S-Eigenvalue Concept for Linear Continuous-Time Systems with Probabilistic Uncertainties

Young Bong Seo, Jae Weon Choi(Pusan Nat'l Univ., KOREA)

We propose a concept of the S-eigenvalue(stochastic-eigenvalue) along with corresponding eigenvector, and then we define the PDF corresponding to the S-eigenvalue on a complex plane. Based on the S-eigenvalue concept, we will establish the S-stability concept for linear continuous-time systems with probabilistic uncertainties in the system matrix. These results explicitly characterize how the S-eigenvalue in the complex plane may impose S-stability on S-eigenstructure assignment. Finally, we present numerical examples to illustrate the proposed concept.

15:10 – 15:30

TP06-6

### Derivative State Constrained optimal $H_2$ Control for Quadruple-tank process

Arjin Numsumran, Thanit Trisuwannawat, Kittit Tirasesth(KMITL, THAILAND)

- Introduction
- Dynamical of the quadruple-tank process
- $H_2$  Integral Servo Problems
- Verification via simulation
- Conclusions