I-FP06 Control Theory 2

13:00-15:00 **Chair : Tsutomu Mita (Tokyo Institute of Technology)**
Room : C206 **Co-Chair : Bae jong-il (Pukyong National univ.)**

13:00 – 13:20 **I-FP06-1**

A Novel Concept on Stochastic Stability

Seo Young Bong, Jae Weon Choi
(Pusan National Univ.)

This paper is concerned with a novel S-stability (stochastic-stability) concept in linear time-invariant stochastic systems, where a stochastic mode in dynamics depends on both the external disturbance and the inner- parameter variations. This leads to an EAG (eigenstructure assignment gaussian) problem; that is, the problem of associating S-eigenvalues (stochastic-eigenvalues), S-eigenvectors (stochastic-eigenvectors), and their PDFs (probability density functions) with the stochastic information of the systems with the required stochastic specifications. These results explicitly characterize how S-eigenvalues, S-eigenvectors and their PDFs in the complex plane may impose S-stability on stochastic systems.

13:20 – 13:40 **I-FP06-2**

Advanced Disturbance Observer Design

Bong Keun Kim, Wan Kyun chung
(POSTECH)

Disturbance observer(DOB) based controller design is one of the most popular methods in the field of motion control. In this paper, a generalized disturbance compensation framework, called as robust internal-loop compensator(RIC) is introduced and an advanced design method of DOB is proposed based on the RIC. Mixed sensitivity optimization problem, which is the main issue of DOB design, is solved through the parameterization of DOB in the RIC framework. Different from conventional methods, Q-filter is separated in the mixed sensitivity optimization problem and the systematic design law for the DOB is proposed. This guarantees the robustness and optimality of the DOB and also enables the design for unstable plants.

13:40 – 14:00 **I-FP06-3**

Control of Flexible Link using Mixed H_2/H_∞ and μ-Synthesis Method

Y.W.Choe, H.K.Lee, J.I.Bae
(Pukyong National Univ.)

This paper investigates the simultaneous use of mixed H2/H_inf and mu-synthesis design methodology to design a robust controller for flexible link. We adopt four steps to design control system as follows: Step1: Generally, there are differences between the nominal and real model, so we consider the plant as a combination of parametric model uncertainty * and unstructured uncertainty ** represents real structural uncertainties associated with the damping ratios of the flexible modes retained in the nominal model without payload. **denotes the uncertainty which is due to the payload added at the tip. Step2: We adopt the mixed H2/H_inf theory to design a feedback controller K(s) by using the model uncertainty ...

14:00 – 14:20 **I-FP06-4**

Robust Adaptive Controller Free from Input Singularity for Nonlinear Systems Using Universal Function Approximators

Jang-Hyun Park, Pil-Sang Yoong, Gwi-Tae Park
(Korea Univ.)

In this paper, we proposed and analyze an robust adaptive control scheme for uncertain nonlinear systems using universal function approximators. The proposed scheme completely overcomes the singularity problem which occurs in the indirect adaptive feedback linearizing control. No projection in the estimated parameters and no switching in the control input are needed. The stability of the closed-loop systems is guaranteed in the Lyapunov standpoint.

14:20 – 14:40 **I-FP06-5**

Sufficient and Necessary Condition for Monotone Nondecreasing Step Response of Second-Order System

Byung-Moon Kwon, Oh-Kyu Kwon(Inha Univ.)
Dae-Woo Kim(Medical Research Lab., Unix Electronics Company)

This paper is shown that the impulse and unit step response of second-order system can be computed by the analytic methods using Laplace transform. Also, the transient response specifications are explicitly formulated by the peak undershoot and maximum overshoot of the step response. Three different second-order systems are investigated: prototype system, system with LHP(left half plane) real zero, and system with RHP(right half plane) real zero. Based on these analytic results, this paper presents the sufficient and necessary conditions for the second-order linear SISO(single- input/single-output) stable system to have the nonovershooting or monotone nondecreasing step response.