I-TE06

Control Theory / Nonlinear Application

15:20-17:20 **Chair : Lee Seon Ho(KARI)**
Room : C206 **Co-Chair : Takashi Fujmoto(Kyushu Sangyo Univ.)**

15:20 – 15:40 **I-TE06-1**

A Nonlinear Transformation Approach to Adaptive Output Feedback Control of Uncertain Nonlinear Systems

Choon-Ki Ahn, Beom-Soo Kim, Myo-Taeg Lim
(Korea Univ.)

In this paper, we present a global adaptive output feedback control scheme for a class of uncertain nonlinear systems to which adaptive observer backstepping method may not be applicable directly. The allowed output feedback structure includes quadratic and multiplicative dependency of unmeasured states. Our novel design technique employs a change of coordinates and adaptive backstepping. With these proposed tools, we can remove linear and quadratic dependence on the unmeasured states in the state equation. Also, the multiplication of the two unmeasured states can be eliminated...

15:40 – 16:00 **I-TE06-2**

Robust integral tracking control of Magnetic Levitating System via feedback linearization

WonKee Son, YongJun Kim and JinYoung Choi,
(Seoul National Univ.)

This paper deals with robust integral tracking control problem based on Lyapunov method via FL(Feedback Linearization) in order to solve a reference tracking problem of nonlinear system with parameter uncertainties. To overcome a restrictive matching condition the uncertainties is characterized in a suitable form. The design procedure which combine FL and LMIs(Linear Matrix Inequalities) based on Lyapunov method to achieve the robust performance and stability is developed. Finally, the performance of proposed controller is demonstrated via simulation of a linear reference tracking problem in the MLS(Magnetic levitating System).

16:00 – 16:20 **I-TE06-3**

A Gain-Scheduled Autopilot Design for a Bank-To-Turn Missile Using LMI Optimization and Linear Interpolation

Myoung Ho Shin, Myung Jin Chung, Chiul Hwa Lee
(KAIST)

A gain-scheduled autopilot design for a bank-to-turn (BTT) missile is developed by using the Linear Matrix Inequality (LMI) optimization technique and a state-space linear interpolation method. The missile dynamics are brought to a quasilinear parameter varying (quasi-LPV) form. Robust linear control design method is used to obtain state feedback controllers for the LPV systems with exogenous disturbances at the frozen values of the scheduling parameters. Two gain-scheduled controllers for the pitch axis and the yaw/roll axis are constructed by linearly interpolating the robust state-feedback gains. The designed controller is applied to a nonlinear six-degree-of-freedom (6-DOF) simulations.

16:20 – 16:40 **I-TE06-4**

Sliding mode control of a nonlinear electromagnetic levitation system

Takashi FUJIMOTO
(Kyushu Sangyo Univ.)

Major objective of this paper is to develop the sliding mode control method for a nonlinear electro magnetic levitation system governed by a set of a second-order motion equation and a first-order electromagnetic equation. Simulations for initial responses were carried out to confirm the validity of the present design method.

16:40 – 17:00 **I-TE06-5**

Fast Gain Scheduling Using Fuzzy Disturbance Estimator

Seon-Ho Lee
(KARI)

The resulting stabilizing controller in this paper consists of the disturbance estimator and the gain scheduled controller. The disturbance estimator tracks the unknown external disturbance and its derivative information in the closed-loop control system using fuzzy logic based adaptation law. Moreover, the gains of the stabilizing controller are appropriately scheduled according to the estimated values. Furthermore, since the estimation law is combined with the stabilizing controller in the closed control loop, it asymptotically minimizes the estimation error. In order to conrm the usefulness of the proposed control scheme, it is applied to the magnetic suspension systems.
