D-TP05 Control Theory 2

13:00-15:00 **Chair : Lee In-Beum (POSTECH)**
Room : 4134 **Co-Chair : Choi Jin Young (Seoul National Univ.)**

13:00 – 13:20 **D-TP05-1**

Performance Tuning Method of Inverse Optimal PID Control for Mechanical Systems

Choi Youngjin, Chung Wan Kyun and Youm Youngil
(POSTECH)

This paper suggests an inverse optimal PID control design method for the trajectory tracking case of mechanical systems. Also, simple coarse/fine performance tuning laws are suggested based on the analysis for performance limitation of inverse optimal PID controller. Experimental results for a robot manipulator show the validity of our analysis for the performance tuning methods.

13:20 – 13:40 **D-TP05-2**

Design of Stable Time-varying Sliding Mode System

Kim Ga-Gue, Ma Jin-Suk, Lim Chae-Deok and Choi Bong-Yeol
(Electronics and Telecommunications Research Institute)

In this paper, we present a new time-varying sliding mode system that guarantees stable error convergence. The previous papers have dealt with stability of the time-varying sliding mode system by point-wisely investigating the stability of time-invariant system every time. However, it may be unstable even though it guarantees time-invariant stability every time. We designed the time-varying sliding surface so that the resultant time-varying system on sliding mode may be stable. The initial sliding surface is obtained so that shifting distance of the surface may be minimized with respect to an initial error, and the intercept is produced so that the surface may pass the initial error.

13:40 – 14:00 **D-TP05-3**

Predictive Spacecraft Attitude Control under External Disturbances

Myung Hyun-Sam, Oh Choong-Suk, Bang Hyo-Choong and Tahk Min-Jea
(KAIST)

The predictive control is one of the nonlinear three-axis rotation methods. The desired trace of a satellite is pre-determined, and the control inputs are designed so that the satellite follows the 'predictive' trace. The predictive control has been adapted to the research for the three-axis attitude control. In that case, the control variables are the quaternion represented the angular rates and attitude angles of the body about the three-axes. The objective of this paper is to propose to design a predictive controller for the three-axis attitude control under external disturbances. In order to do that, this paper proposes how to construct a predictive control law including disturbances and to discern them. The basic algorithm of the existent predictive control is partially modified, and the presumption and modeling of disturbances are performed...

14:00 – 14:20 **D-TP05-4**

Delay-dependent Guaranteed Cost Control for Uncertain Time Delay System

Ohmin Kwon , Sangchu Won I and Dong Yue
(Pohang University of Science and Technology)

In this paper, we propose a delay-dependent guaranteed cost controller design method for uncertain linear systems with time delay. The uncertainty is norm bounded and time-varying. A quadratic cost function is considered as the performance measure for the given system. Based on the Lyapunov method, suffcient condition, which guarantees that the closed-loop system is asymptotically stable and the upper bound value of the closed-loop cost function is not more than a specied one, is derived in terms of Linear Matrix Inequalities(LMIs) that can be solved suffciently. A convex optimization problem can be formulated to design a guaranteed cost controller, which minimizes the upper bound value of the cost function. Numerical examples show the e ectiveness of the proposed method.

14:20 – 14:40 **D-TP05-5**

A Novel Controller Design Method for Time-Delay System with the Integral Mode

Ma Jin Suk, Kwon Woo Hyen, Kim Sun Ja, Kim Ga Gyu and Lee Hyung Suk
(ETRI)

In this paper, we present a novel control method for the plant with an integral mode and long time delay. In a constant time delay problem, one can independently adjust the set response and the disturbance response by the proposed DTC without any additional control variables. To verify the effectiveness of the proposed DTC, it is compared with Matausek's DTC and Normey-rico's DTC which were recently proposed. Simulation results are given and the superior performance of the proposed scheme over the conventional schemes are successfully verified.