I-TP06 Control Theory / Robustness 2

13:00-15:00 **Chair : Shim Kyu Hong (Sejong Univ.)**
Room : C206 **Co-Chair : Lim Myo-Taeg (Korea Univ.)**

13:00 – 13:20 **I-TP06-1**

Robust Control for Singularly Perturbed Uncertain Systems with State Constraints

Sang-Yup Lee, Eung-Ju Kim, Beom-Soo Kim, Myo-Taeg Lim
(Korea University)

We deal with robust control problem for singularly perturbed linear systems with norm-bounded structured uncertainty under state constraints. We assume that the norm-bounded uncertainty is composed of repeated scalar-block and full-block forms. In the structured uncertainty, repeated scalar block forms account for uncertain physical parameter value and full-block forms may be some unknown nonlinear dynamics. In order deal with uncertainty and state constraints, we use LMI(Linear Matrix Inequality). The original problem is decomposed into two well behaved reduced order problems. Shinc two LMI problems are completely independent, each solution can be computed simultaneously and work in parallel.

13:20 – 13:40 **I-TP06-2**

Robust and High Performance Control for Optical Disk Drive Systems Using Error based Disturbance Observer

Kwangjin Yang, Wan Kyun Chung, Youngil Youm
(POSTECH)

There are many control methods guaranteeing the robustness of systems. Among them, H∞ control, sliding mode control and disturbance observer have been used widely. Especially, disturbance observer(DOB) is one of the most popular methods because it is easy to apply and the cost to pay is low due to its simplicity. Conventional DOB utilizes output signal as a feedback signal. But in Optical Disk Drive(ODD) systems, the Position Error Signal(PES) is the only available one. So conventional DOB is not applicable. If we use error signal in stead of output signal, another form of DOB is made. We call it as Error based Disturbance Observer(EDOB). We show in this paper the difference between two systems, namely conventional DOB system and the EDOB system, and also show the effectiveness of EDOB through experiment.

13:40 – 14:00 **I-TP06-3**

Robust H^∞ Filtering for discrete-Time Polytopic Uncertain Systems with Multiple Time Delays

Jong Hae Kim and Hong Bae Park
(Kyungpook National Univ.)

The design method of H^∞ filter for discrete-time uncertain linear systems with multiple state delays is investigated. The uncertain parameters are assumed to be unknown but belonging to known convex compact set of polytope type less conservative than norm bounded parameter uncertainty. The modified H^∞ performance measure is introduced to consider the initial states values which affect the performance of filter. The objective is to design a stable H^∞ filter guaranteeing asymptotic stability of filtering error dynamics and minimizing H^∞ norm bound. The sufficient condition for the existence of filter and the filter design method are established by LMI (linear matrix inequality) approach.

14:00 – 14:20 **I-TP06-4**

Robust High Gain Adaptive Output Feedback Control for Nonlinear Systems with Uncertain Nonlinearities in Control Input Term

Ryuji Michino, Ikuro Mizumoto, Zenta Iwai, Makoto Kumon
(Kumamoto Univ.)

It is well known that one can easily design a high-gain adaptive output feedback control for a class of nonlinear systems which satisfy a certain condition so called output feedback exponential passivity (OFEP). The designed highgain adaptive controller has simple structure and high robustness with regard to bounded disterbances and unknown order of the controlled system. However, from the viewpointof practical application, it is important to consider a robustcontrol scheme for controlled systems for which some of the assumptions of output feedback stabilization are not valid. In this paper, we deal with a design problem of the robusthigh-gain adaptive output feedback control for the OFEP nonlinear systems with uncertain nonlinearities and/or disturbances.

14:20 – 14:40 **I-TP06-5**

Reliable Robust Control for Singularly Perturbed Systems by Delta Operator Approach

Kyu-Hong Shim(Sejong Univ.), Chariya Loescharataramdee(King Mongkut Institute of Technology) M.Edwin Sawan(Wichita State Univ.)

This paper presents a reliable H^∞ controller design for singularly perturbed systems by the delta operator approach that guarantees stability with a known H^∞ norm bound in case of failures in some control channels. Prespecified are the control channels that may experience failures. Sensor outage is covered in this paper. It is shown that the delta systems have improved finite word-length characteristics in the example.