I-TA06

Control Theory/ Robustness 1

08:30-10:30 **Chair : Young Soo Suh (Ulsan Univ.)**
Room : C206 **Co-Chair : Young Il Lee (Seoul Univ.)**

08:30 – 08:50 **I-TA06-1**

Temperature Control of a Reheating Furnace using Feedback Linearization and Predictive Control

Jae Hun Choi, YuJin Jang, Sang Woo Kim
(POSTECH)

Reheating furnace is a facility of heating up the billet to desired high temperature in the hot charge rolling process and it consists of 3 zones. Temperature control of reheating furnace is essential for successful rolling performance and high productivity. Mostly, temperature control is carried out using PID controller. However, the PID control is not effective due to the nonlinearity of the reheating furnace(i.e, presence of the interference of neighboring zones and slow response of temperature etc.). In this paper, feedback linearization method is applied to obtain a linear model of the reheating furnace. Then, controller is designed using simple predictive control method. The effctiveness of this strategy is shown through simulations.

08:50 – 09:10 **I-TA06-2**

Receding Horizon Predictive Control for Nonlinear Time-delay Systems

Wook Hyun Kwon, Young Sam Lee, Soo Hee Han
(Seoul Univ.)

This paper proposes a receding horizon predictive control (RHPC) for nonlinear time-delay systems. The control law is obtained by minimizing finite horizon cost with a terminal weighting functional. An inequality condition on the terminal weighting functional is presented, under which the closed-loop stability of RHPC is guaranteed. A special class of nonlinear time-delay systems is introduced and a systematic method to find a terminal weighting functional satisfying the proposed inequality condition is given for these systems. Through a simulation example, it is demonstrated that the proposed RHPC has the guaranteed closed-loop stability for nonlinear time-delay systems.

09:10 – 09:30 **I-TA06-3**

Output feedback receding horizon control for uncertain LTV systems

Seuncheol Jeong and PooGyeon Park
(POSTECH)

In this paper, a robust receding horizon controller for uncertain linear time-varying systems is presented in the dynamic output-feedback form. The existing output-feedback receding horizon controller in the literature is composed of a state observer and a static controller associated with the observer states (similar to LQC control), where the fundamental assumption is that the state observer will supply the exact states as time goes up. The performance of those controllers may be much degraded and even the closed-loop stability may not be guaranteed when the system suffers from disturbances and uncertainties or is time-varying. The proposed controller, which is not necessary to have the state-observer, overcomes such difficulties. Using matrix inequality conditions on the terminal weighting matrix, the closed-loop system stability is guaranteed. Numerical examples are...

09:30 – 09:50 **I-TA06-4**

Robust Constrained Predictive Control without On-line Optimizations

Y. I. Lee, B. Kouvaritakis
(Seoul Univ.)

A stabilizing control method for linear systems with model uncertainties and hard input constraints is de- veloped, which does not require on-line optimizations. This work is motivated by the constrained robust MPC(CRMPC) approach [3] which adopts the dual mode prediction strategy (i.e. free control moves and invariant set) and minimizes a worst case performance criterion. Based on the observation that, a feasible control sequence for a particular state can be found as a linear combination of feasible sequences for other states, we suggest a stabilizing control algorithm providing sub-optimal and feasible control sequences using pre-computed optimal sequences for some canonical states. The on-line computation of the proposed method reduces to simple matrix multiplication.