D-TA01 Chemical Process Control/Automation

08:30-10:30 **Chair : Lee In-Beum (POSTECH)**
Room : 4127 **Co-Chair : Han Myungwan (Chungnam National Univ.)**

08:30 – 08:50 **D-TA01-1**

Optimal Grade Transition with Partially Structured Model in a Slurry-Phased HDPE Reactor by Modified Hierarchical Dynamic Optimization

Heui-Seok Yi, Chonghun Han (POSTECH), Sang-Seop Na and Jinsuk Lee (Samsung General Chemical Co., Ltd)

Dynamic optimization with partially structured model in a slurry-phase HDPE reactor is implemented by the modified hierarchical dynamic optimization. Optimal trajectories of MI and density of HDPE are calculated as controlled variables and optimal profiles of the concentrations of ethylene, hydrogen and comonomer are calculated as manipulated variables in dynamic optimization. MI, density, the concentrations of ethylene, hydrogen and comonomer are used as controlled variables and flow rates of ethylene, hydrogen and comonomer are sued as manipulated variables in control implementation. Two-level hierarchical method is applied in dynamic optimization to reduce computation time. In the upper level formulation ...

08:50 – 09:10 **D-TA01-2**

Robust Evolutionary Programming Technique for Optimal Control Problems

C. Park, and T. Lee
(KAIST)

Optimal control problems are notoriously difficult to solve either analytically or numerically except for limited cases of having simple dynamics. Evolutionary programming is a promising method of solving various optimal control problem arising in practice since it does not require the expression of Lagrange's adjoint system and that it can easily implement the inequality constraints on the control variable, In this paper, evolutionary programming is combined with spline method, so the smoother control profile and the jumping times could be obtained. The optimal profiles obtained by the proposed method are compared with exact solution if it is available. With more complicated model equation, the proposed method showed better performance than other researchers'. It is demonstrated that the evolutionary programming with spline method can ...

09:10 – 09:30 **D-TA01-3**

Nonlinear Model Based Control of Two-Product Reactive Distillation Column

Myungwan Han
(Chungnam National Univ.)

Nonlinear feedback control scheme for reactive distillation column has been proposed. The proposed control scheme is derived in the framework of Nonlinear Internal Model Control. The product compositions and liquid and vapor flow rates in sections of the reactive distillation column are estimated from selected tray temperature measurements by an observer. The control scheme is applied to example reactive distillation column in which two products are produced in a single column and the reversible reaction A + B = C + D occurs. The relative volatilities are favorable for reactive distillation so that the reactants are intermediated boilers between the light product C and the heavy product D. Ideal physical properties, kinetics and ...

09:30 – 09:50 **D-TA01-4**

Constrained Digital Regulation of Hyperbolic PDE Systems: A Learning Control Approach

Jinhoon Choi, Beom Joon Seo, Kwang Soon Lee
(Sogang Univ.)

In this paper, exploiting repetitive properties, a constrained digital regulation technique for first order hyperbolic PDE systems is proposed that guarantees the stability and performance of the closed loop system.

09:50 – 10:10 **D-TA01-5**

Analytical Method to Design Multiloop Control Systems via DCLR

Kim Changgeun, Daewoong Chun, Jietae Lee(Kyungpook National Univ.)
Kihong Lee, Monyong Lee(Youngnam Univ.)

Although many advanced control strategies and concepts have been proposed recently, the most popular controller in the process industries is the PID controller because of its simplicity, easy implementation, and robustness. A multiloop PID controller design method using the general IMC tuning rule is presented in this paper. The IMC-PID controller is formed by combining the integral term designed by considering interactions between the individual loops with the proportional and derivative terms designed in circumstance neglecting the interactions. The multiloop PID controller designed by the proposed method can approximate the ideal multiloop controller throughout overall frequency range, and ...

10:10 – 10:30 **D-TA01-6**

Design of Glide Slope Capture Logic Using Model Inversion

HyungSik Choi, CheolKeun Ha(Ulsan Univ.)
ByoungSoo Kim (Kyungsang Univ.)

This paper deals with a design of nonlinear glide slope capture logic using dynamic model inversion in singular perturbation, which is applicable to the autolanding in ILS. Aircraft dynamics are separated into the fast time-scale variables, related with the inner-loop design, and the slow time-scale variables, related with the outer-loop design. It is assumed that the aircraft starts landing at 1000ft of altitude, -2.5deg of flight path angle, and 250ft/sec of velocity . In the outer-loop design, commands of altitude and velocity are selected and thereby the pseudo-controls of power level and pitch rate are determined. Also the elevator input to the aircraft is determined in the inner-loop design. The final design is evaluated in 6 DOF simulation model of the associated aircraft, in which the actuator models are not included. The results show the satisfactory autolanding ...