I-SA06 Control Theory 4

09:00-11:00 Chair : Oh Kyu Kwon (Inha Univ.)
Room : C206 Co-Chair : Kee Ho Yu (Chonbuk National Univ.)

09:00 – 09:20 I-SA06-1

Some Integral Equalities Related to Laplace Transformable Function

Byung-Moon Kwon, Oh-Kyu Kwon(Inha Univ.)
Myung-Eui Lee(Korea Univ.)

This paper establishes some integral equalities formulated by zeros located in the convergence region of Laplace transformable function. Using the definition of Laplace transform, it is shown that time-domain integral equalities have to be satisfied by the function, and those can be applied to understanding of the fundamental limitations of the control system represented by the transfer function, which has been Laplace transform. In the unity-feedback control scheme, another integral equality is also derived on the output response of the system with open-loop poles and zeros located in the convergence region.

09:20 – 09:40 I-SA06-2

Two-degree-of-freedom control for descriptor system with disturbance

Tae Kyeong YEU and Shigeyasu KAWAJI
(Kumamoto Univ.)

In this paper, the design of a two-degree-of-freedom(TDF) controller is proposed to track the reference model, as well as to reject an influence of measurable disturbance for descrpitor system. The TDF controllers based on the Youla parametrization reveals that the design of the feedforward controller and the regulator can be done independently. First, to solve this problem, we will change descriptor system into regular state space system using a state feedback. And then, the feedforward controller is determined by solving a full-information approach for augmented system with a nominal control constraint, and the regulator is designed by means of the loop-shaping method.

09:40 – 10:00 I-SA06-3

FFC Design for PI Flow Control System Designed by CDM

D. Kumpanya, T. Benjanarasuth, J. Ngamwiwit
(King Mongkut's Institute of Technology)
N.Komine(Takai Univ.)

A design of PI controller to be used to control the first-order lag plus dead time process, such as a flow process, by the coefficient diagram method (CDM) is investigated. The factor of the dead time of process is first approximated to be the first-order by the Pade approximation. The response of the flow control system designed by CDM satisfy both transient and steady state specifications. However, the transient response generally still has long rise time. In order to improve the speed of the system response, a feedforward controller (FFC) is added into the PI control system. The structure of the FFC is a phase lead structure with two designed parameters and one derivative time obtained from the reaction curve of the flow process ...

10:00 – 10:20 I-SA06-4

Chattering-Free Sliding Mode Control with a Time-Varying Sliding Surface

Tai Hyun Kyung, Jong Shik Kim(Pusan National Univ.),
Kyu-Joon Lee(ADD)

Chattering-free sliding mode control is derived from the reaching law method and Lyapunov stability theorem. Its control input is composed of continuous term and discontinuous term. By the combination of these terms, the robustness and tracking performance can be improved and the chattering can be avoided. But in the reaching mode, the sliding mode control is sensitive to the modeling uncertainties, parameter variations and disturbances, also it needs a large control input. These result in poor transient responses. In this paper, to overcome these problems in the reaching mode, a time-varying sliding surface is proposed. And it is applied to a 2-link SCARA robot manipulator, experimental results show that the transient response is improved and its ...

10:20 – 10:40 I-SA06-5

Discrete-Time Sliding Mode Control for Linear Systems with Matching Uncertainties

Kohei Myoen , Hiromitsu Hikita , Naohiko Hanajima , and Mitsuhisa Yamashita (Muroran Institute of Technology)

Sliding mode control is investigated for a discrete-time system with uncertainties. The narrowest neighborhood of the sliding surface is shown in which the state can remain. The range is determined by the upper bound of the absolute value of the uncertainty and the equation of the sliding surface. A sliding mode control algorithm is proposed to keep the state there without requiring an enormous input. Under the presence of the system parameter variations, the origin is not always stable although the sliding surface represents the stable dynamics and the state is kept in this neighborhood. The condition for the origin to be stable is investigated. Furthermore, the problems occurring when a continuous-time sliding mode control being ...