I-FA06

Control Theory 1

09:00-11:00 — **Chair : Hikaru Inooka (Tohoku Univ.)**
Room : C206 — **Co-Chair : Komatsu Ken Ichirou (Tohoku Univ.)**

09:00 – 09:20 — **I-FA06-1**

Control Systems Design Based on Disturbance Cancellation via LTR Technique

M. Imai, T. Ishihara, T. Ono, and H. Inooka
(Tohoku Univ.)

For a plant subject to several kinds of disturbances in the plant input side, we consider a problem of designing a controller based on the disturbance cancellation. The conventional loop transfer recovery (LTR) technique can not be used since the extended system consisting of the plant and the disturbance model is not necessarily stabilizable. We propose a new LTR technique that can be applied for our problem. As a target of the LTR, we choose a state feedback controller using a disturbance estimator. We find an LTR procedure based on the Riccati equation formalism where the stochastic model contains the filter gain matrix of the disturbance estimator in the target. The procedure recovers the target feedback...

09:20 – 09:40 — **I-FA06-2**

Input-Output Feedback Linearizing Control With Parameter Estimation Based On A Reduced Design Model

Kap Kyun Noh, Dongil Shin and En Sup Yoon
(Seoul National Univ.)

By the state transformation including independent outputs functions, a nonlinear process model can be decomposed into two subsystems; the one(design model) is described in output variables as new states and used for control system synthesis and the other(disturbance model) is described in the original unavailable states and its couplings with the design model are treated as uncertain time-varying parameters in the design model. Its existence with respect to the design model is ignored. So, the design model is an uncertain time-variant system. Control synthesis based on a reduced design model is a combined ...

09:40 – 10:00 — **I-FA06-3**

Control systems design based on the principle of matching with the genetic algorithm incorporating Lamarkism

Ken-ichirou KOMATSU, Tadashi ISHIHARA, Hikaru INOOKA (TOHOKU Univ.), Toshiyuki SATOH (AKITA Prefectural Univ.)

The principle of matching is a new framework for control systems design that requires the matching between the control system and the environment (the source of exogenous inputs). The principle is especially useful for the design of the critical control systems where the responses of the control systems should be kept below the prescribed values. The design problem is reduced to find controller satisfying inequality constraints. However, conventional optimization techniques do not possess structural model selection ability and designers are required to select appropriate controller model. We propose to use a genetic algorithm to find an appropriate controller satisfying the matching conditions. The proposed genetic algorithm ...

10:00 – 10:20 — **I-FA06-4**

Design of Disturbance Observer for Track-following Controller of Optical Disk Drive

Jung Rae Ryoo, Tae-Yong Doh and Myung Jin Chung
(KAIST)

In this paper, a design guideline of disturbance observer(DOB) for track-following controller is presented. In the track-following control system(TFCS) of optical disk drive(ODD), disturbance rejection is the key issue for the overall performance. DOB gives an excellent advantage of disturbance rejection within its bandwidth determined by a low-pass filter. In general, design of DOB requires a tradeoff between performance and stability, which should be based on quantitative analysis. The external disturbance is well-defined in the frequency domain, which provides the base of the analysis. In addition to a DOB, a proper feedback controller is utilized for guaranteeing overall stability. Some computer simulations and experiments are conducted and some of the results are presented.

10:20 – 10:40 — **I-FA06-5**

Construction of a robust tracking system with N-th sampling delay

M.Ohta, and Y.Kamiya
(Kitami Institute of Technology)

In the past, we presented the tracking system with one sampling delay. In this paper, first we propose a tracking system with N-th sampling delay, in the case where an input-output pulse transfer function of a plant is Z^{-N} Secondly we propose a system configuration converting an input-output pulse transfer function of a plant into Z^{-N} with the inverse system of the plant. Moreover, the proposed tracking system configuration is applied to an actual Ball and Beam system and good results are obtained.