I-TP05 Identification and Estimation 2

13:00-15:00 **Chair : Oh Kyu Kwon (Inha Univ.)**
Room : C204 **Co-Chair : Yoshifumi Okuyama (Tottori Univ.)**

13:00 – 13:20 **I-TP05-1**

Evolutionary Computation Approach to Wiener Model Identification

Toshiharu Hatanaka, Katsuji Uosaki , Masazumi Koga
(Tottori Univ.)

We address a novel approach to identify a nonlinear dynamic system for Wiener models, which are composed of a linear dynamic system part followed by a nonlinear static part. The aim of system identification here is to provide the optimal mathematical model of both the linear dynamic and the nonlinear static parts in some appropriate sense. Assuming the nonlinear static part is invertible, we approximate the inverse function by a piecewise linear function. We estimate the piecewise linear inverse function by using the evolutionary computation approach such as genetic algorithm (GA) and evolution strategies (ES), while we estimate the linear dynamic system part by the least squares method. The results of numerical simulation studies indicate the usefulness of proposed approach to the Wiener model identification.

13:20 – 13:40 **I-TP05-2**

Stabilization of Nonlinear Discrete-Time Systems in a Frequency Domain

Yoshifumi OKUYAMA, Kenji NAKAMORI ,Fumiaki TAKEMORI
(Tottori Univ.)

The robust stability condition for sampled-data control systems with a sector nonlinearity was presented in our previous paper. Although it is applicable only to the sampled-data control system of a certain class, a usual discretetime control system can belongs to this type of class. This paper analyzes the amplitude dependent behavior of nonlinear sampled-data (i.e., discrete-time) control systems in a frequency domain. By considering restricted areas (sectors) in the nonlinear characterisitic, the existence of a sustained oscillation is estimated, and the relationship between the stable/unstable conditions and the result derived from describing function is compared. Based on these considerations, the stabilization of nonlinear discrete-time control systems is examined in the frequency domain.

13:40 – 14:00 **I-TP05-3**

Robust Residual Generator for Fault Detection Using H∞ FIR Estimation Method

Hee-Seob Ryu, Ho-Jun Yoo, Oh-Kyu Kwony(Inha Univ.)
Kyung-Sang Yoo(Doowon Tech. College)

This paper considers a fault detection and diagnosis using estimation method in uncertain systems. In the state estimation method, we use the robust H∞ FIR filtering algorithm. A novel aspect of the fault detection technique described here is that it explicitly accounts for the effects of simplified models and errors due to the linearization of nonlinear systems at an operating point.

14:00 – 14:20 **I-TP05-4**

Solvability of Stochastic Discrete Algebraic Riccati Equation

Yibing Tang, Michio Kono (Miyazaki Univ.)
Tatsuo Suzuki (Mitsubishi Heavy Indstries)

This paper considers a stochastic discrete algebraic Riccati equation, which is a generalized version of the well-known standard discrete algebraic Riccati equation, and has additional linear terms. Under controllability, observability and the assumption that the additional terms are not too large, the existence of a positive definite solution is guaranteed. It is shown that it arises in optimal control of a linear discrete-time system with multiplicative white noise and quadratic cost. A numercial example is given.

14:20 – 14:40 **I-TP05-5**

Multidimensional Spectral Estimation by Modal Decomposition

Liu Wei-Ping
(Department of Electronics, Ta Hwa Institute of Technology)

We consider here the problem of spectral estimation of multidimensional wide sense stationary (WSS) random process. A method, employing a special difference equation of correlation function, is proposed to solve the problem of multidimensional spectral estimation. In this approach, the special difference equation of correlation function is derived by modal decomposition method. Maximum likelihood estimator and Kalman filter are used to estimate the model parameters of the difference equation and the decomposed spectral residues. An algorithm is presented to estimate the multidimensional spectral density. According to the result of the simulation, these methods are feasible to estimate the spectral density of WSS process, which is realized by finite dimensional multivariable linear system driven by white noise.