I-FE06 Control Theory 3

15:20-17:20 **Chair : Park Jin Bae (Yonsei Univ.)**
Room : C206 **Co-Chair : Niwa Shohei (SIST)**

15:20 – 15:40 **I-FE06-1**

Anticontrol of Chaos for a Continuous-time TS Fuzzy System via Time-delay Feedback

Zhong Li, Jin Bea Park(Yonsei Univ.),
Young Hoon Joo(Kunsan Univ.)

A time-delay feedback control approach is proposed for making a given stable continuous-time Takagi-Sugeno (TS) fuzzy system chaotic, which is based on the fuzzy feedback linearization and a suitable approximate relationship between a time-delay differential equation and a discrete map. The time-delay feedback controller, chosen among several candidates, is a simple sinusoidal function of the delay states of the system, which has small amplitude. This approach is mathematically proven for rigorous generation of chaos from stable continuous-time TS fuzzy systems, where the generated chaos is in the sense of Li and Yorke. Numerical examples are included to visualize the theoretical analysis and the controller design.

15:40 – 16:00 **I-FE06-2**

Adaptive Phase-Locked Loop for Process Control System

S. Wanchana, T. Benjanarasuth, J. Ngamwiwit (King Mongkut's Institute of Technology Ladkrabang), N. Komine (Tokai Univ.)

This paper presents the application of adaptive phase-locked loop (adaptive PLL) technique to control the process variable of the process control system. The adaptive algorithm is related to the error. When the error of the system is changed, the adaptive gain will be directly changed according to the error. If the value of the adaptive gain is large, the value of the error will be large. In this experiment, the reference input is 50% step input. The experimental result in controlling the first order lag process by the adaptive PLL shows that the response of the controlled system has no overshoot, short rise time, and zero steady-state error. The experimental result also shows that when the output disturbance enters to the process control system, the adaptive PLL can maintain the stability of the system and the effect of the output disturbance can also be fast rejected. The adaptive PLL has better performance ...

16:00 – 16:20 **I-FE06-3**

Real Time Optimal Control of Mechanical Systems

Kei Imafuku, Yuh Yamashita, Hirokazu Nishitani
(Nara Institute of Science and Technology)

In this work, we consider a real time optimal control problem of mechanical systems with restrictions for actuators (i.e. input restrictions) and constraints for the movable area (i.e. state constraints). First, we formulate an optimal control problem which evaluates the cost function for a finite time horizon with input restrictions and state constraints of a wheeled vehicle as an example of mechanical systems. In this problem, the differentiability of the cost function is not required and this implies that the problem cannot be solved analytically. Therefore, in this work, we use an optimization method to solve the optimal control problem and a new real time optimization method is proposed to solve the problem. In this method, we provide a parameter that indicates the ...

16:20 – 16:40 **I-FE06-4**

Position Control by Fuzzy Logic Controller with Acceleration Converter

A. Kanchanathep, J. Ngamwiwit (King Mongkut's Institute of Technology), S. Tunyasrirut(Pathumwan Institute of Technology), R. Kanawa (Yonago National College of Technology)

The integrated environment for the fuzzy logic controller with the acceleration converter to improve the dynamic characteristic of a one-axis moving table is proposed in the paper. The two inputs of the fuzzy logic controller are position error and velocity. The two inputs of the acceleration converter used to produce the acceleration input for the one-axis moving table are actual and setting rotational speeds. The proposed controller is implemented on a personal computer by using MATLAB and Visual Basic for a real time control via a motion control board. The position control results when the stair input is applied to control the position of the one-axis moving table, are shown. The experimental results of the proposed position control system are compared to the conventional PID ...

16:40 – 17:00 **I-FE06-5**

Robust Friction Compensation Control Usaing a Nonliner Observer

Yuichiro Nakamura, and Shohei Niwa
(Shizuoka Institute of Science and Technology)

The research of friction compensation control system seeks the accuracy, the velocity increase of the table, and the settling time reduction. The friction is the disturbance which has the greatest influence, but the past research of control system doesn't perform exact modeling of the friction. So this research aims at the friction compensation control system, the exact modeling of the friction, comparison between the model simulation and experimental data, and the design of observer for the friction estimation.

17:00 – 17:20 **I-FE06-6**

CMOS Current Sum/Subtract Circuit

Jirawath Parnklang, Ampual Manasaprom
(King Mongkut's Institute of Technology Ladkrabang)

The basic circuit block diagram of CMOS current mode sum and subtract circuit is present in this paper. The purpose circuit consists of the invert current circuit and the basic current mirror. The outputs of the circuit are the summing of the both input current [Ix+Iy] and also the subtract of the both input current [Ix+(-Iy)]. The SPICE simulation results of the electrical characteristics with level 7 (BSIM3 model version 3.1) MOSFET transistor model of the circuit such as the input dynamic range, the frequency response and some system application have been shown and analyzed.