D-SP03 Intelligent Control

13:00 – 15:00 **Chair : Park Jaehyun (Inha Univ.)**
Room : 4129 **Co-Chair : Kang Chul Goo (Konkuk Univ.)**

13:00 – 13:20 **D-SP03-1**

A Fuzzy Control of a 3-dimensional Inverted Pendulum Using a 3-axis Cartesian Robot

Shin Ho Sun, Chu Jun Uk and Lee Yun Jung
(Kyungpook National University)

Conventional researches almost have been focused on the one dimensional inverted pendulum. Recently, Sprenger et al[2] have researched a two dimensional inverted pendulum. Observing human's action to control an inverted pendulum, one can recognize that human uses a three dimensional motion including the up and down motion. In this paper, we propose a fuzzy logic controller(FLC) of a new three dimensional inverted pendulum system. We derive a dynamic equation of the mechanism including a3-axis cartesian robot and a inverted pendulum. We propose a design method of a fuzzy controller of the yaw and pitch angles of a inverted pendulum. In the design, the redundant degree-of-freedom(DOF) of the robot ...

13:20 – 13:40 **D-SP03-2**

Design of the Fuzzy Sliding Mode Controller and Neural Network Interpolator for UFV Depth Control

Kim Hyun-Sik(Agency for Defense Development)
Park Jin-Hyun(Chinju National Univ.)
Choi Young-Kiu(Pusan National Univ.)

In Underwater Flight Vehicle depth control system, the followings must be required. First, it needs robust performance which can get over nonlinear characteristics. Second, it needs accurate performance which have small overshoot phenomenon and steady state error. Third, it needs continuous control input. Finally, it needs interpolation method which can solve the speed dependency problem of controller parameters. To solve these problems, we propose a depth control method using Fuzzy Sliding Mode Controller and Neural Network Interpolator. Simulation results show the proposed method has robust and accurate control performance by the continuous control input and has no speed dependency problem.

13:40 – 14:00 **D-SP03-3**

A Consideration on Load Disturbance Characteristics of Realtime Adaptive Learning Controller based on an Evolutionary algorithms - Application to an Electro Hydraulic Servo System

Sung-Ouk, Jin-Kul Lee
(Pusan National Univ.)

Hydraulic servo system has the characteristic of high power in itself, as combining its characteristics with excellent electro equipment that comes from the development of electronics, electro·hydraulic servo system is widely used in industry that are requested high precision and power. Electro·hydraulic servo system is characteristic of very strong non-linearity in itself and it is mainly applied the field of the inner or outer fluctuating load or disturbance in industry. Evolutionary computation based on the natural evolutionary process may solve many engineering problems. Algorithms can represent the natural selection in crossovers, mutations, production of the offspring, selection, etc. Nature has already shown is the superiority through ...

14:00 – 14:20 **D-SP03-4**

Study on Iterative Learning Controller with a Delayed Output Feedback

Hak-Sung Lee
(Sejong Univ.)

In this paper, a novel type of iterative learning controller is studied. The proposed learning algorithm utilizes not olny the error signal of the previous iteration but also the delayed error signal of the current iteration. The delayed error signal is adopted to improve the convergence speed. The convergence condition is examined and the result shows that the proposed learning algorithm shows the fast convergence speed under the same convergence condition of the traditional iterative learning algorithm. The simulation examples are presented to confirm the validity of the proposed ILC algorithm.

14:20 – 14:40 **D-SP03-5**

H∞ Fuzzy Dynamic Output Feedback Controller Design with Pole Placement Constraints

Jongcheol Kim, Sangchul Won
(POSTECH)

This paper presents a fuzzy dynamic output feedback controller design method for Parallel Distributed Compensation (PDC)-type Takagi-Sugeno (T-S) model based fuzzy dynamic system with H1 performance and additional constraints on the closed pole placement. Design condition for these controller is obtained in terms of the linear matrix inequalities (LMIs). The proposed fuzzy controller satisfies the disturbance rejection performance and the desired transient response. The design method is verified by this method for an inverted pendulum with a cart using the proposed method.