D-SA04 Nonlinear Control Theory

09:00-10:00 **Chair : Oh Jun-Ho (KAIST)**
Room : 4133 **Co-Chair : Lim Myo-Taeg (Korea Univ.)**

09:00 – 09:20 **D-SA04-1**

On Stability of Discrete Time Nonlinear Systems with Slow-in-the-average Time Varying Inputs

Y. S. Shin, J. T. Lim
(KAIST)

In this paper we show the stability analysis of the discrete nonlinear system with average bounded variation of the input. This is the discrete counterpart of that continuous one. We use the Lyapunov stability to prove the boundedness of the steady-state error. Also the allowable maximum varation bounds and the region of attraction are given as the function of the system parameters. Moreover, we prove the uniform convergence for the constant input

09:20 – 09:40 **D-SA04-2**

A New Nonlinear Feedback Controller Eventually Converges to SDRE Based Optimal Controller

Sang-Bin Yim, Jun-Ho Oh
(KAIST)

We introduce a new stable feedback controller eventually converges to a conventional SDRE(State Dependent Riccati Equation) based optimal (suboptimal) controller. On conventional SDRE, the optimal control input should be obtained by backward integration of the SDRE at each control point. The proposed controller is given by direct forward integration of a proposed SDRE. This fact enables fast computation and easy implementation. On concerning a state dependent system, the proposed controller may be a candidate to the conventional SDRE based optimal controller if the system is slow varying with states. Though the controller is fast and easy to implement it is not able to cope with a fast varying system. We introduce an optimality index, which indicates how far the proposed controller is deviated from the solution of the convectional SDRE. If the index escapes a ...

09:40 – 10:00 **D-SA04-3**

Dynamic Feedback Linearization of Nonlinear Discrete-Time Systems with 2 Inputs

Cho Hyung-Joon, Ryu Dong-Young, Park Se-Yeon Lee Hong-Gi
(Chung-Ang Univ.) and Kim Yong-Min(Choongchung Univ.)

In this paper, we find the necessary and sufficient conditions of linearization of nonlinear discrete-time systems with 2 inputs using the restricted class of dynamic feedback. That is, this paper is the discrete version of [2]. The results we obtain for discrete-time nonlinear systems are, however, quite different from that of continuous-time case.

10:00 – 10:20 **D-SA04-4**

Design of Generalized Predictive Controller for Chaotic Nonlinear Systems Using Fuzzy Neural Networks

Jong-tae Choi, Jin-bae Park(Yonsei Univ.)
and Yoon-ho Choi(Kyonggi Univ.)

In this paper, the Generalized Predictive Control(GPC) method based on Fuzzy Neural Networks(FNNs) is presented for the control of chaotic nonlinear systems without precise mathematical models. In our method, FNNs is used as the predictor whose parameters are tuned by the error between the actual output of nonlinear chaotic system and that of FNNs model. The parameters of GPC controller are adjusted via the gradient descent method where the difference between the actual output and the reference signal is used as a control error. Finally, computer simulation on the representative continuous-time chaotic system(Duffing system) is presented to demonstrate the effectiveness of our chaos control method.

10:20 – 10:40 **D-SA04-5**

Target Motion Analysis for Active/Passive Mixed-Mode Sonar Systems

Lim Young Taek and Song Taek Lyul
(Hanyang University)

Target Motion Analysis(TMA) for Passive Sonar Systems with bearing-only measurements needs to enhance system observability to improve target tracking performance by ownship maneuvering. However, tracking problem incurred by weak observaility result in slow convergence of the target estimates. On the other hand, active sonar systems do not have problem associated with system observaility. However, it drawback related to system survivability. In this paper, the algorithm that could be used in Active/Passive Mixed-Mode Sonar Systems is proposed to analyze maneuvering target motion and to improve TMA performance. The proposed TMA algorithm is tested by a series of computer simulation runs and the results...

10:40 – 11:00 **D-SA04-6**

Fuzzy System and Knowledge Information for Stock-Index Prediction

Kim Hae-Gyun, Bae Hyeon and Kim Sung-Shin
(Pusan National University)

In recent years, many attempts have been made to predict the behavior of bonds, currencies, stock , or other economic markets. Most previous experiments used multilayer perceptrons(MLP) for stock market forecasting. The Kospi 200 Index is modeled using different neural networks and fuzzy system predictions. In this paper, a multilayer perceptron architecture, a dynamic polynomial neural network(DPNN) and a fuzzy system are used to predict the Kospi 200 index. The results of prediction is compared with the root mean squared error(RMSE) and the scatter plot. The results show that the fuzzy system is performing slightly better than DPNN and MLP. We can develop the desired fuzzy system by learning methods...