FA03 Nonlinear Control I

09:00-11:00 **Chair1 : Masatoshi Nakamura (Saga Univ., Japan)**
Room : Base 1st Floor-Otztal **Chair2 : Jin-shig Kang (Cheju Nat'l Univ., Korea)**

09:00 – 09:20 **FA03-1**

Nonlinear Control of General System based on a Model with Coefficients of State-Depended Representation

Masatoshi NAKAMURA, Tao ZHANG(Saga Univ., JAPAN)

This paper addresses a method for nonlinear controller construction for a general nonlinear system with the separation of controller construction and manipulated values generation. The nonlinear system model is firstly expressed with the coefficients of state-depended representation. The nonlinear control is designed without any approximation based on the model with state-depended representation. At the stage of controller implementation for the nonlinear system, the manipulated values are calculated accurately by use of an algorithm of the numerical analysis. The numerical error for calculating the manipulated value can be reduced to zero by selecting the sampling interval being a small val...

09:20 – 09:40 **FA03-2**

LPD(Linear Parameter Dependent) System Modeling and Control of Two Wheeled Mobile Robot

Jin-Shig Kang(Cheju Nat'l Univ., KOREA)

Because of the wheeled mobile robot is modeled by nonlinear system framework and controlled by nonlinear algorithms or fuzzy algorithms, the treatment of wheeled mobile robot is very complecate and conservative. In this paper, a new model of two wheeled mobile robot, which is a type of linear system and treated easily, is presented. And we will show that the control algorithms based on the linear system theory is well work to the wheeled mobile robot by simulation and experiment.

09:40 – 10:00 **FA03-3**

Design of an Augmented Automatic Choosing Control via Hamiltonian and GA for a class of Nonlinear Systems with Constrained Input

Toshinori Nawata(Tech. Kumamoto Nat'l College, JAPAN), Hitoshi Takata(Kagoshima Univ., JAPAN)

The purpose of this paper is to present a new nonlinear feedback control called AACC (Augmented automatic choosing control) for nonlinear systems.
Generally, it is easy to design the optimal control laws for linear systems, but it is not so for nonlinear systems, though they have been studied for many years. One of most popular and practical nonlinear control laws is synthesized by applying a linearization method by Taylor expansion truncated at the first order and the linear optimal control method. This is only effective in a small region around the steady state point or in almost linear systems. Controllers based on a change of coordinates in differential geometry are effective in wider...

10:00 – 10:20 **FA03-4**

Design of PI/PID Controller by CDM for Speed Control of Two-Inertia Systems

Apicit Tantaworrasilp, Jongkol Ngamwiwit, Sumit Panaudomsup, Taworn Benjanarasuth(KMITL, THAILAND), Noriyuki Komine(Tokai Univ, JAPAN)

- Contents 1 Introduction
- Contents 2 Model of Two-inertia System
- Contents 3 Concept of CDM
- Contents 4 Controller Design
- Contents 5 Experimental Results
- Contents 6 Conclusions

10:20 – 10:40 **FA03-5**

A Nash Solution to Predictive Control Problem for a Class of Nonlinear Systems

Choon Ki Ahn, Wook Hyun Kwon(Seoul Nat'l Univ., KOREA)

In this paper, we provide a Nash solution to predictive control problem for nonminimum phase singular nonlinear systems. Until now, there is no result on predictive control problem for this class of nonlinear systems. Chen's recent work considered predictive control problem for a class of nonlinear systems with ill-defined relative degree. Since his work is not a result considered in the feedback linearization framework, there is no a result on singular probem in his paper. In contrast to the existing predictive control result, our work considers two main obstacles (singularity and nonminimum phase) in the feedback linearization framework. For a generally formu...

10:40 – 11:00 **FA03-6**

A Non-linear Control of A Magnetic Levitation System Based on Passivity

Toshimi Shimizu, Minoru Sasaki(Gifu Univ., JAPAN)

Introduction
Modeling
Controller
Simulation
Experiment
Conclusion