I-TA01 Adaptive Learning and Computer Control

08:30-10:30 **Chair : Abe Kenichi (Tohoku Univ.)**
Room : C105 **Co-Chair : Park Jin Bae (Yonsei Univ.)**

08:30 – 08:50 **I-TA01-1**

Multiple-Channel Active Noise Control by ANFIS and Independent Component Analysis without Secondary Path Modeling

Eung-Ju Kim, Sang-yup Lee, Beom-Soo Kim, Myo-Taeg Lim
(Korea Univ.)

In this paper we present Multiple-Channel Active Noise Control[ANC] system by employing Independent Component Analysis[ICA] and Adaptive Network Fuzzy Inference System[ANFIS]. ICA is widely used in signal processing and communication and it use prewhiting and appropriate choice of non-linearities, ICA can separate mixed signal. ANFIS controller is trained with the hybrid learning algorithm to optimize its parameters for adaptively cancelling noise. This new method which minimizes a statistical dependency of mutual information(MI) in mixed low frequency noise signal and there is no need to secondary path modeling. The proposed implementations achieve more powerful and stable noise reduction than Filtered-X LMS algorithms which is needed for LTI assumption and precise secondary error channel path modeling.

08:50 – 09:10 **I-TA01-2**

Flexible Labeling Mechanism in LQ-learning for Maze Problems

Haeyeon Lee, Hiroyuki Kamaya, Kenichi Abe,
Hiroyuki Kamaya
(Tohoku Univ.)

Recently, Reinforcement Learning (RL) methods in MDP have been extended and applied to the POMDP problems. Currently, hierarchical RL methods are widely studied. However, they have the drawback that the learning time and memories are exhausted only for keeping the hierarchical structure, though they aren't necessary. On the other hand, our "Labeling Q-learning (LQ-learning) proposed previously, has no hierarchical structure, but adopts a characteristic internal memory mechanism. Namely, LQ-learning agent percepts the state by pair of observation and its label, and the agent can distinguish states, which look as same, but obviously different, more exactly. So to speak, at each step t, we deffne a new type of perception of its environment ˜ot = (ot, Θt), where ot is conventional observation, and Θt is the label attached to the observation. Then the conventional ...

09:10 – 09:30 **I-TA01-3**

Formation of Attention and Associative Memory based on Reinforcement Learning

Katsunari Shibata

(Oita University)

An attention task, in which context information should be extracted from the frst presented pattern, and the recognition answer of the second presented pattern should be generated using the context information, is employed in this paper. An Elman-type recurrent neural network is utilized to extract and keep the context information. A reinforcement signal that indicates whether the answer is correct or not, is only a signal that the system can obtain for the learning. Only by this learning, necessary context information became to be extracted and kept, and the system became to generate the correct answers. Furthermore, the function of an associative memory is observed in the feedback loop in the Elman-type neural network.

09:30 – 09:50 **I-TA01-4**

Novel Discrete Optimal Sliding Mode Control

Seung Kyu Park, Ho Kyun Ahn, Min Chan Kim
(Changwon National University)

Abstract-In this paper, the discrete optimal control is made to have the robust property of Sliding mode controller. A augmented system with a virtual state is constructed for this objective and noble sliding surface is constructed based on this system. The sliding surface is the same as the optimal control trajectory in the original system. The states follow the optimal trajectory even if there exist uncertainties. The reaching phase problem of sliding mode control is desappear in this method.

09:50 – 10:10 **I-TA01-5**

Vibration Control of a Intelligent Cantilevered Beam with a Distributed PVDF Sensor and PZT Actuator

Yeo-Hung Yun, Tae-Kyu Kwon, Seong-Cheol Lee, and Kee-Ho Yu
(Chonbuk National Univ.)

Robust control of a GFR composite beam with a distributed PVDF sensor and piezo-ceramic actuator is presented in this paper. Modal analysis method and modal coordinates are introduced to obtain the state equations of the structural system. 1st and 2nd natural frequencies are considered in the modeling, because robust control theory which is robustness to structured uncertainty is adopted to suppress the vibration. If the controllers designed by H∞ theory do not satisfy control performance, it is improved by μ-synthesis method with D-K iteration so that the μ-controller based on the structured singular value satisfies the nominal performance and robust performance...