I-TE01 Neural Networks

15:20 – 17:20 **Chair : Jin Sang Ho (Doowon Tech. College)**
Room : C105 **Co-Chair : Abe Kenichi (Tohoku Univ.)**

15:20 – 15:40 **I-TE01-1**

Control of Chaos Dynamics in Jordan Recurrent Neural Networks

Masao Sakai, Noriyasu Homma, Kenichi Abe(Tohoku Univ.)

We propose two control methods of the Lyapunov exponents for Jordan-type recurrent neural networks. Both the two methods are formulated by a gradient-based learning method. The first method is derived strictly from the definition of the Lyapunov exponents that are represented by the state transition of the recurrent networks. The first method can control the complete set of the exponents, called the Lyapunov spectrum, however, it is computationally expensive because of its inherent recursive way to calculate the changes of the network parameters. Also this recursive calculation causes an unstable control when, at least, one of the exponents is positive, such as the largest Lyapunov exponent in the recurrent networks with chaotic dynamics. To improve stability in the chaotic situation, we propose a non recursive formulation by approximating...

15:40 – 16:00 **I-TE01-2**

Evolutionary designing neural networks structures using genetic algorithm

Minoru ITOU, Masanori SUGISAKA(Oita Univ.)

In this paper, we consider the problems of the evolutionary designed neural networks structures by genetic algorithm. Neural networks has been applied to various application fields since back-propagation algorithm was proposed, e.g. function approximation, pattern or character recognition and so on. However, one of difficulties to use the neural networks. It is how to design the structure of the neural network. Researchers and users design networks structures and training parameters such as learning rate and momentum rate and so on, by trial and error based on their experiences. In the case of designing large scales neural networks, it is very hard work for manually design by try and error. For this difficulty, various structural learning algorithms have been proposed. Especially, the technique of using genetic algorithm for networks structures design has been...

16:00 – 16:20 **I-TE01-3**

Design of a Pseudo Gaussian Function Network Using Asymmetric Activation Functions

Byung Man Kim, Hyung Suck Cho

(KAIST)

In conventional RBF network, the activation functions of hidden layers generally are symmetric functions like gaussian function. This has been considered to be one of the limiting factors for the network to speed up learning of actuately describing a given function. To avoid this criticism, we propose a pseudo gaussian function (PGF) whose deviation is changed according to the direction of incoming pattern. This property helps to estimate the given function more effectively with a minimal number of centers because of its flexibility of functional representation. A level set method is used to describe the asymmetric shape of deviation of the pseudo gaussian function. To demonstrate the performance of the proposed network...

16:20 – 16:40 **I-TE01-4**

An Application of ANN to Automatic Ship Berthing under Disturbances and Mortion Identification

Namkyun Im, Kazuhiko Hasegawa
(Osaka Univ.)

This paper deals with motion identification using artificial neural network (ANN) and its application to automatic ship berthing. As ship motions are expressed by multi-term non-linear model, it is very difficult to find optimal methods for automatic ship berthing especially under environmental disturbances. In this paper, motion identification was used to estimate the effect of environmental disturbances and then the differences between values of identification and state variables are used to estimate the effect of environmental disturbances. A rule based-algorithm using the difference is suggested to cope with the effect of the disturbances. The algorithm adjusts the value of input units of ANN, which control a ship to keep desired route ...

16:40 – 17:00 **I-TE01-5**

A New Methodology for the Optimal Design of BSB Neural Associative Memories Considering the Domain of Attraction

Yonmook Park, Min-Jea Tahk, Hyo-Choong Bang
(KAIST)

This paper considers a new synthesis of the optimally performing brain-state-in-a-box (BSB) neural associative memory given a set of prototype patterns to be stored as asymptotically stable equilibrium points with the large and uniform size of the domain of attraction (DOA). First, we propose a new theorem that will be used to provide a guideline in design of the BSB neural associative memory. Finally, a design example is given to illustrate the proposed approach and to compare with existing synthesis methods.

17:00 – 17:20 **I-TE01-6**

Adaptive Actor-Critic Learning of Mobile Robots Using Actual and Simulated Experiences

Rafiuddin Syam, Keigo Watanabe, Kiyotaka Izumi, Kazuo Kiguchi(Saga Univ.) Sang-Ho Jin(Doowon Technical College)

In this paper, we describe an actor-critic method as a kind of temporal di.erence (TD) algorithms. The value function is regarded as a current estimator, in which two value functions have different inputs: one is an actual experience; the other is a simulated experience obtained through a predictive model. Thus, the parameter's updating for the actor and critic parts is based on actual and simulated experiences, where the critic is constructed by a radial-basisfunction neural network (RBFNN) and the actor is composed of a kinematic-based controller. As an example application of the present method, a tracking control problem for the position coordinates and azimuth of a nonholonomic mobile robot is considered. The effectiveness is illustrated by a simulation.