Developing New Information Systems Based on Neural Networks

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Research Topics

- Modular neural networks
- New concept neuron model
- Neural system design for combinatorial optimization problems

Research Seeds

Most existing neural network models interpret biological behaviors in terms of time-averaging techniques rather than direct emulation. It is a reasonable simplification to handle macroscopically the collective computational properties of the networks. However, the direct emulations are main concerns to the single or microscopic neuron models. Therefore, we have proposed the Inverse function Delayed Model (ID model) to represent networks with neurons in a critical state. The most important feature of the ID model is to include negative resistance dynamics.

Neural networks have been used for solving combinatorial optimization problems that require finding the best combination for a minimum or maximum cost. Then they compute in parallel and do so rapidly. However, the existence of local minima has posed a severe difficulty: it interferes with searching global minima as the optimal solution. Our proposed ID model can destabilize undesirable stable states actively using negative resistance, so that we expect that the ID model is a powerful tool to find an optimal solution of a combinatorial optimization problem.

At our laboratory, we are developing various new information systems using neural networks such that a system can solve combinatorial optimization problems.

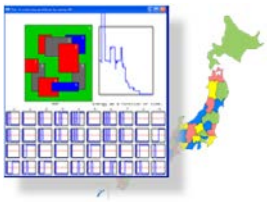

Fig. 1: Four color problem.

Fig. 2: Minesweeper.

Related Technology

- Nonlinear dynamics
- Application development by neural network technology
- Parallel computation technology