

AIHARA LAB.

[Mathematical Modeling for Solving Complex Problems]

Department of Informatics and Electronics

<http://www.sat.t.u-tokyo.ac.jp>

Biological Information Systems

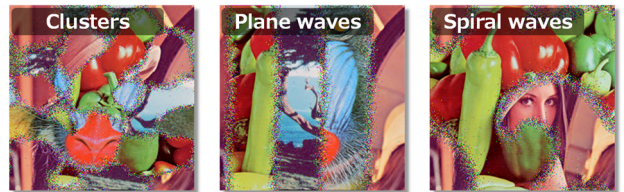
Dept. of Mathematical Informatics, Grad. School of Information Science and Technology
Dept. of Electrical Engineering and Information Systems, Grad. School of Engineering

Mathematical Modeling for Solving Complex Problems

We study a variety of complex systems and problems—biological systems, social systems, economic systems, diseases, energy problems, natural disasters, and so on—through mathematical modeling and data analyses. We also try to establish fundamental theories and methods for analyzing those specific systems. We are jointly working with the Collaborative Research Center for Innovative Mathematical Modelling.

Brain: Large-scale Simulation

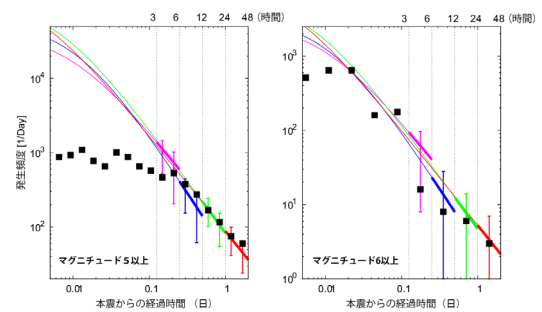
To understand the information processing in the brain, we study complex dynamics of neural network models. We have investigated efficient computational techniques and useful data visualization methods for large-scale simulations, which enables detailed analysis on complex behavior such as traveling waves.



Traveling waves in large-scale neural network models

Earthquake: Aftershock Forecast

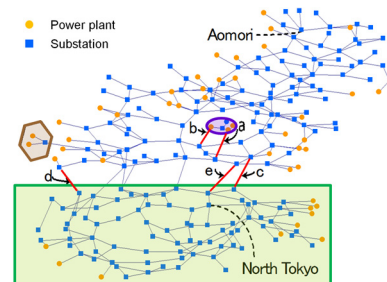
A large earthquake is followed by a vast number of aftershocks. Since large aftershocks can cause secondary damages in the affected area, it is important to give a probability forecast of aftershocks. However, accurate forecast within one day after the main shock has been difficult due to the observational difficulty. In our study, we have developed a method that enables us to forecast the aftershock activity in real-time.



Forecast experiment of aftershock activity of 2011 Tohoku-oki earthquake M9.0

Power Grid: Mathematical Analysis

Electric power systems face new problems due to large-scale introduction of renewable energy such as solar and wind power. To solve this, we try to develop new mathematical models for both qualitative and quantitative analyses and establish theoretical framework for stable and efficient power supply.



Identification of important links for stable power supply in East Japan