Kazuyuki Aihara

IRCN,
Institute of Industrial Science,
Graduate School of Information Science and Technology, Graduate School of Engineering,
The University of Tokyo

Title

Nonlinear Dynamics and Bifurcations in Neurons

Abstract

Although simple neuron models like the McCulloch-Pitts model and its variants are mainly used in the present AI, spiking dynamics of real neurons is much more dynamical and complex. Further, nonlinear neuronal dynamics can be characterized by its bifurcation structure which typical examples are the class I neuron with the saddle-node bifurcation and the class II neuron with the Hopf bifurcation.

In this talk, I review nonlinear dynamics, bifurcations and mathematical models of neurons as a basis for understanding the brain dynamics. I also explain some examples of neuromorphic and neuroinspired computations and hardware implementations for bridging between neuroscience and AI toward possible applications.

Biography

I received a B.E. degree in electrical engineering and Ph.D. degree in electronic engineering from the University of Tokyo (UTokyo), Tokyo, Japan, in 1977 and 1982, respectively. I led the ERATO (Exploratory Research for Advanced Technology) Aihara Complexity Modelling project for JST (Japan Science and Technology Agency) from 2003 to 2008 and the FIRST Innovative Mathematical Modelling project by JSPS (Japan Society for the Promotion of Science) through the FIRST (Funding Program for World-Leading Innovative R&D Science and Technology) program from 2010 to 2014 for CSTP (Council for Science and Technology Policy).