Joint AARMS-CRM Workshop: Recent Advances in Functional and Delay Differential Equations
1–5 November 2007

Neural computation with periodic attractors: memory and time lags

Jianhong Wu
Department of Statistics
University of Toronto
100 St.George Street
Toronto, Ontario M5S 3G3
CANADA
jian@utstat.toronto.edu

Abstract

This talk addresses the issue how to design and compute a network with feedback, that exhibits complex but desired dynamical behaviors for some particular cognitive tasks. We illustrate the linkage between neural computation with attractors and the memory storage/retrieval using the additive network of neurons, and discuss the simplicity-capacity dilemma arising from the requirement for a network to posses a large number of stable patterns and to be easily implemented. We then propose a novel approach based on signal processing delay and show the interaction of delay, feedback and refractoriness in a simple inhibitory network of two neurons can generate three basic types of oscillations and these three basic oscillations can then be pinned together to form a large num ber of interesting coexisting periodic patterns. Therefore, a simple and small network with delayed feedback can process a large amount of information. How connection topology of a large network enhances the networks capacity for memory storage and retrieval remains to be an interesting task.