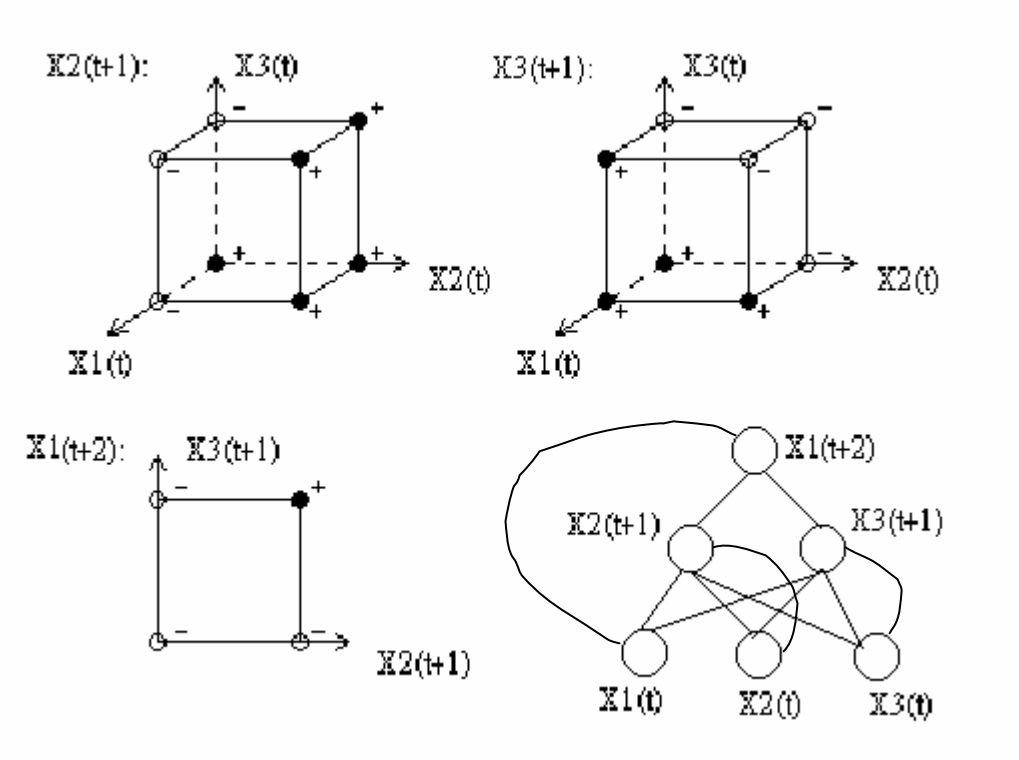
Chapter 6

Synthesis of Associative Memory

Exercise

6.1 (I) Discuss and analyze this Hopfield network:



(II) Given [$x_1(t)$, $x_2(t)$, $x_3(t)$; t = 0, …., 1000], the functions of {$x_2(t+1)$, $x_3(t+1)$, $x_1(t+2)$} are unknown. Show how to train this Hopfield network to obtain these functions. Use the modular design in exercise #6.

6.2 There are two types of neurodynamical models (14.18) and (14.19).

(i) Similar to (14.28), Derive the energy function for (14.19) given it is a Hopfield model satisfying (14.21), (14.22), (14.23), (14.27).

(ii) A: $x_j(n+1) = \text{sgn}[\sum_{i=1}^{N} w_{ji} x_i(n)]$, j = 1, 2, …, N, (Text page 690, item 3)

B: $v_j(n+1) = \sum w_{ji}\,\mathrm{sgn}[v_i(n)]$, j = 1, 2, …, N, (Text page 678, on bottom)

A & B describe a net with binary decision elements, i.e., 2-valued logic. Which one can be constructed so as to give any wanted number k of values at each neuron (k need not be the same for all neurons); they describe therefore as well a net working with some k-valued logic? Show how to construct?