Exact results for the average dynamic behavior of some non-linear neural networks

Rössler, J.

Varela, F. J.

We have studied the global dynamic behavior of neural-like networks of synchronous threshold elements by writing a master equation as a function of parameter values using statistical methods. Exact results for highly connected networks and no correlation are obtained, showing that in this case (contrary to previous results) the average activity can only display simple stable behaviour, the sole exception being special cases of a slow passage through a tangent bifurcation, and a limit cycle of length two. By introducing an appropriate probabilistic hypothesis, we also study the average activity and correlation for highly connected networks with the topology of a (Cayley) tree. In this case the dynamic is ruled by a pair of coupled equations linking activity and correlation, and the tendency is for the correlation to dispappear over time. However, under reasonable biological conditions, this tendency will be extremely slow, giving rise to a region of pseudo-stability. © 1987 Springer-Ver