AN ADAPTIVE HYSTERESIS THRESHOLD METHOD FOR AN ASSOCIATIVE MEMORY USING MUTUALLY CONNECTED NEURAL NETWORK

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ABSTRACT

A new adaptive threshold method is proposed for an associative memory using mutually connected neural network. In a learning process, the network state, that is the unit state $u_i(m)$, is fixed to a pattern P(m) to be memorized. Connection weights are iteratively adjusted so that the unit input satisfies $v_i(k) \geqq \theta$ for $u_i(m)=1$, and $v_i(k) \leqq -\theta$ for $u_i(m)=0$. In an association process, P(m) is recollected from its degraded version Q(m). The network state is initially set to be Q(m). At the nth state transition step, if $v_i(n) \geqq \phi(n)$, then $u_i(n+1)=1$. If $v_i(n) \leqq -\phi(n)$, then $u_i(n+1)=0$. Furthermore, if $-\phi(n) < v_i(n) < \phi(n)$, then $u_i(n+1)=u_i(n)$. $\phi(n)$ is initially chosen to be $\phi(0) > \theta$, and is gradually decreased as $\phi(n)=\phi(0)-\alpha n$, where α is constant. Computer simulation was carried out, using 51 and 153 patterns, which appear on a key board. A neural network has 16x16=256 units and full connections. The results demonstrate that drastic improvements in a memory capacity and association rates can be achieved. For example, an association rate for 51 patterns with 40 noises has been increased from 12.2% to 97.7%, compared with a single threshold method.