REFLEXIVE ASSOCIATIVE MEMORIES

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Abstract:

In the synchronous discrete model, the average memory capacity of bidirectional associative memories (BAMs) is compared with that of Hopfield

memories, by means of a calculat10n of the percentage of good recall for 100 random BAMs of dimension 64x64, for different numbers of stored vectors. The memory capac1ty Is found to be much smal1er than the Kosko upper bound, which

Is the lesser of the two dimensions of the BAM. On the average, a 64x64 BAM has about 68 %

of the capacity of the corresponding Hopfield memory with the same number of neurons. Ortho(cid:173) normal coding of the BAM

Increases the effective storage capaCity by only 25 %. The memory capacity limitations are due to spurious stable states, which

arise In BAMs In much the same way as in Hopfleld memories. Occurrence of spurious stable states can be avoided

by replacing the thresholding in the backlayer of the BAM by another nonl1near process, here called "Dominant Label Selection" (DLS).

The simplest DLS is the wlnner-take-all net, which gives a fault-sensitive memory. Fault tolerance can be improved by the use

of an orthogonal or unitary transformation. An optical application of the latter is a Fourier transform, which is implemented simply

by a lens.