On basins of attraction in attractor neural networks SUCHITRA
SAMPATH, VIPIN SRIVASTAVA[1], Centre for Neural and Cognitive Sciences, University of Hyderabad, Hyderabad -500046. India — We present an in-depth study
of basin of attraction for patterns of ± 1 inscribed following Hebbian hypothesis [1]
in a spin-glass like neural network. The aim is to investigate if basin of attraction
being *non-zero* is a sufficient condition for the stability of an inscribed state when
the necessary condition is that the inscribed state should be retrieved without any
error. While this is true for Hopfield model [1], we find that the following model is an
exception in that as many as *p=N-1* stored patterns (*N* being the number of neurons
in a fully connected network) can be retrieved without error while their basins of
attraction consistently reduce in size as *p* increases and become zero around *p=0.8N*.
The model proposes that the information that comes to be recorded in the brain is
first orthogonalized (as in Gram-Schmidt orthogonalization) and then inscribed in
synaptic weights. While the orthogonalized versions of input vectors with ± 1 components are stored in the model brain, the original vectors/patterns are retrieved
exactly when checked for retrieval. Simulations are presented that give insight into
the energy landscape in the space spanned by the network states.

[1] J.J. Hopfield,*PNAS* **79**, 2554(1982)

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