# ASSIGNMENT 6 (counts as 2 assignments)

### Due May 5, 2009 (before start of class)

Write a program to implement the discrete Hopfield neural network having $n$ neurons. The algorithm is basically the same as that given in our lecture, except that the transfer function is the sign function with zero bias, and the external input term is absent.

The weights are determined by Hebb's rule with the diagonal elements set to zero, and biases are taken to be zero also. The training set consists of the following 4 vectors:

$$\begin{bmatrix} 1 \\ 1 \\ -1 \\ -1 \\ -1 \\ 1 \end{bmatrix}^T , \quad \begin{bmatrix} 1 \\ -1 \\ -1 \\ 1 \\ -1 \\ -1 \end{bmatrix}^T , \quad \begin{bmatrix} -1 \\ -1 \\ 1 \\ 1 \\ 1 \\ -1 \end{bmatrix}^T , \quad \begin{bmatrix} -1 \\ 1 \\ 1 \\ -1 \\ 1 \\ 1 \end{bmatrix}^T$$

. Neurons should be updated asynchronously and randomly with each neuron updated with equal probability.

1. Test to see if each of the stored vectors can be recalled.

2. Try to input vectors that are near the stored patterns to see how robust the stable points are.

3. Input other vectors to see if the net has spurious stable attractors.

4. Do any other tests that will help you understand the behavior of this particular neural net.