Linear Recurrent Network

Computational Neuroscience by University of Washington

Suppose that we had a linear recurrent network of 5 input nodes and 5 output nodes. Let us say that our network's weight matrix W is:

$$W = \begin{bmatrix} 0.6 & 0.1 & 0.1 & 0.1 & 0.1 \\ 0.1 & 0.6 & 0.1 & 0.1 & 0.1 \\ 0.1 & 0.1 & 0.6 & 0.1 & 0.1 \\ 0.1 & 0.1 & 0.1 & 0.6 & 0.1 \\ 0.1 & 0.1 & 0.1 & 0.1 & 0.6 \end{bmatrix}$$

Suppose that we have a static input vector $\mathbf{u}$:

$$\mathbf{u} = \begin{bmatrix} 0.6 \\ 0.5 \\ 0.6 \\ 0.2 \\ 0.1 \end{bmatrix}$$

Finally, suppose that we have a recurrent weight matrix M:

$$M = \begin{bmatrix} -0.75 & 0 & 0.75 & 0.75 & 0 \\ 0 & -0.75 & 0 & 0.75 & 0.75 \\ 0.75 & 0 & -0.75 & 0 & 0.75 \\ 0.75 & 0.75 & 0.0 & -0.75 & 0 \\ 0 & 0.75 & 0.75 & 0 & -0.75 \end{bmatrix}$$

Find the steady state output of the network.