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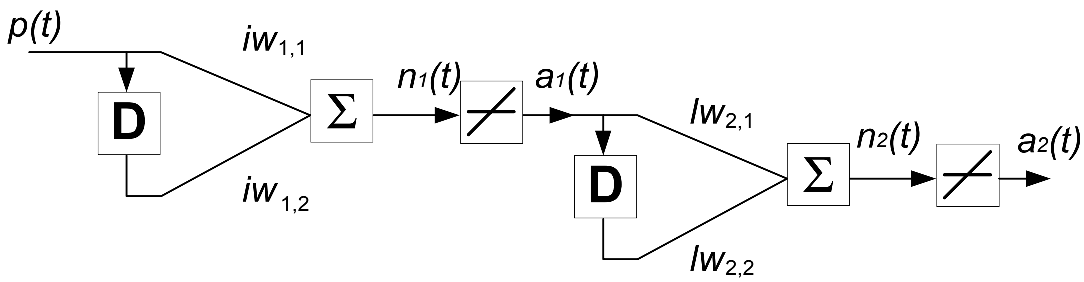
ENEE 434 Midterm Makeup Spring 2002

Take home; due Th 04/18/02

In an Official Examination Book show your work for partial credit for up to 60 additional points. Your dignature guarantees the work is your own - only signed exams will be graded. Open book, open notes, but no consulting of classmates; Good luck.

1. makeup [30 points] In the following neural network let an input sequence be **p**(1) = [-2], **p**(2) = [1], **p**(3) = [5], **p**(4) = [-3] and let the weight matrix be $\mathbf{IW}^{1,1}$ = [2 1] and $\mathbf{LW}^{2,1}$ = [1 2], calculate $a_1(t)$ and $a_2(t)$ for t=0, 1, 2, 3, 4, 5; assume any unknown delay states to be zero and that the inputs are cyclicly repeated. Will the outputs ever cyclicly repeat,(explain your answer)?



3. makeup [3 points]

Thinking to increase the number of exemplars a student proposes a new class of Hopfield networks by changing the activation function from tanh(n). The jth new activation function, $a_j(n)$, is based upon the satlin(n) one, where

tsatlin(n) = 2n1(n)-2(n-1)1(n-1) with 1(n) being the unit step function.

This (j+1)st activation function is defined as

$a_{j+1}(n) = \text{tsatlin}_j(n) + \text{tsatlin}_j(n-2(j+1)) = \text{tsatlin}_{j+1}(n) = a_j(n)+a_j(n-2(j+1))$
for j=0,1,2,..., with $a_0(n)=\text{tsatlin}(n) = \text{tsatlin}_0(n)$

a) Sketch the jth activation function versus the net input n for j=0,1, 2.

b) Using the kth one of these activation functions for each neuron of an m-neuron network, give the differential equation in the presence of resistors R and bias for the resulting Hopfield neural network.

c) These activation functions have set valued inverses. Sketch these inverses for j=0,1,2 and give a formula for the inverse function when j=0.