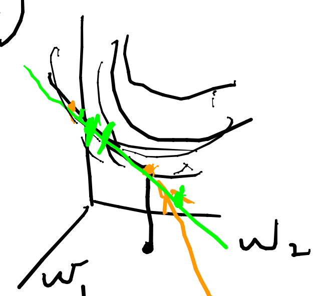
EE434
02/17/05

Weight updates

$$W^m(k+1) = W^m(k) + \Delta W^m(k)$$
$$= W^m(k) - \alpha\, s^m \left(a^{m-1}(k)\right)^T$$

$$b^m(k+1) = b^m(k) - \alpha\, s^m$$



minimum of error surface

α = convergence factor, free to be chosen; $0<\alpha<1$

Can use a more efficient weight update using momentum, "γ" in the text $0 \le \gamma < 1$

p. 12-11
eq. (12.9)

$$\Delta W^m(k+1) = \gamma \Delta W^m(k-1) - (1-\gamma)\alpha\, s^m \left(a^{m-1}\right)^T$$

at next, 6th, step

$W_b^3 = net1.LW\{3,2\} = W_a^3 - \alpha \cdot s_a^3\, a_a^{2\,T} = \begin{bmatrix} -0.0410 & 0.5111 \\ 1.8385 & 0.9799 \end{bmatrix}$

for $\alpha = 0.1$

Demos: Help, demos, toolboxes, neural network, control systems, open model
choose one

ODE for stirred tank:

$$\frac{dh}{dt} = w_1(t) + w_2(t) - 0.2\sqrt{h(t)}$$

w_1 = flow rate of C_{b_1}

w_2 = flow rate of C_{b_2}

$C_b(t)$ = product concentration (of $C_{b_1} \times C_{b_2}$) at output

$$\frac{dC_b}{dt} = (C_{b_1} - C_b)\frac{w_1(t)}{h(t)} + (C_{b_2} - C_b)\frac{w_2}{h} - \frac{k_1 C_b(t)}{(1 + k_2 C_b(t))^2}$$

They set w_1 = constant & adjust w_2 & fix $C_{b_1} = 24.9$, $C_{b_2} = 0.1$

$k_1 = k_2 = 1$ in their simulations

$w_1 = 1$, $w_2 = 0.1$

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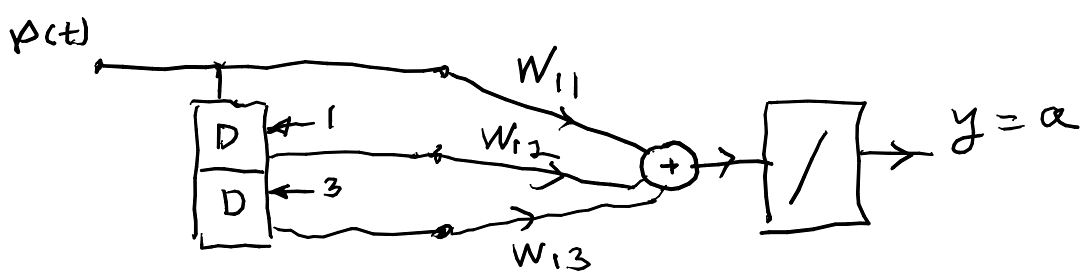
neural networks with delay

$D = 1/z$, $\frac{1}{z}$ = unit delay in EE (in math z = unit delay)

Example




```
P = {1 2 1 3 3 2};
Pi = {1 3};
T = {5.0 6.1 4.0 6.0 6.9 8.0};
net = newlind(P,T,Pi);
Y = sim(net,P,Pi)
```