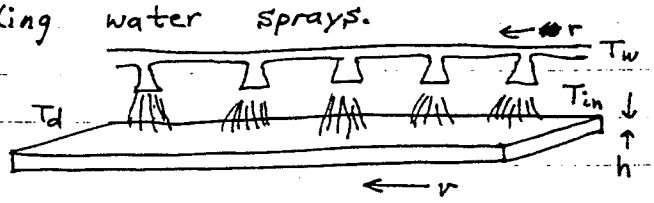
~~Optimization~~

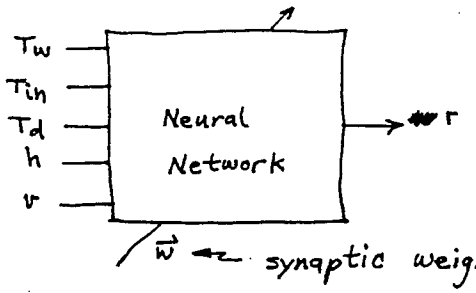
28 Mar 1995

ex: Cooling a bar of steel to desired temperature by controlling water sprays.



variables:
- $T_w \equiv$ temperature of water
- $T_{in} \equiv$ temperature of bar before sprays
- $T_d \equiv$ desired temperature of bar after sprays
- $h \equiv$ thickness of bar
- $v \equiv$ velocity of bar
- $r \equiv$ water flow rate

We use neural network to control the flow:



$\vec{w}$ ← synaptic weights for neural net adapted by gradient descent

We compute the difference between the actual temperature we get after the sprays, T_a, and the desired temperature, T_d, and we square it.

$$E = \frac{1}{2}(T_d - T_a)^2$$

Our gradient descent algorithm for weight w_i is

$$\Delta w_i = -\eta \frac{\partial E}{\partial w_i}$$

We hope that this learning scheme will optimize the values of the synaptic weights in the neural network.