1 Current

$$I_{NA} = -g_{NA} * m(t)^3 * h(t) * (u - E_{NA})$$

$$I_K = g_K \cdot n(t)^4 * (u - E_K)$$

$$I_{Leak} = g_L \cdot (u - E_L)$$

$$I_{x/xx} = g_{x/xx} \cdot (u - E_{x/xx})^2$$

2 Model

2.1 HH

$$C \cdot \frac{du}{dt} = I_{NA} - I_K - I_{Leak} + I(t)$$

$$C \cdot \frac{du}{dt} = -g_{NA} \cdot m(t)^3 \cdot h(t) \cdot (u - E_{NA}) - g_K \cdot n(t)^4 \cdot (u - E_K) - g_L \cdot (u - E_L) + I(t)$$

2.2 HHx/xx

$$C \cdot \frac{du}{dt} = I_{NA} - I_K - I_{Leak} + I_{x/xx} + I(t)$$

$$C \cdot \frac{du}{dt} = -g_{NA} \cdot m(t)^3 \cdot h(t) \cdot (u - E_{NA}) - g_K \cdot n(t)^4 \cdot (u - E_K) - g_L \cdot (u - E_L) + g_{x/xx} \cdot (u - E_{x/xx})^2 + I(t)$$

3 g

$$g_{channel}^{total} = N \cdot g_{channel} \qquad \text{with N = number of active synapses}$$