hodgkin_huxley_squid_axon_1952

1 "environment" component

This component has no equations.

2 "membrane" component

V_diff_calculation

$$\frac{\mathrm{d}(V)}{\mathrm{d}(time)} = \frac{(I - (i\_Na + i\_K + i\_L))}{Cm}$$

3 "sodium_channel" component

E_Na_calculation

$$E\_Na = (E\_R + 115.0)$$

i_Na_calculation

$$i\_Na = g\_Na * (m)^{3.0} * h * (V - E\_Na)$$

4 "sodium_channel_m_gate" component

alpha_m_calculation

$$alpha\_m = \frac{0.1 * (V + 25.0)}{\left(e^{0.1*(V+25.0)} - 1.0\right)}$$

beta_m_calculation

$$beta\_m = 4.0 * e^{\frac{V}{18.0}}$$

dm_dt

$$\frac{\mathrm{d}(m)}{\mathrm{d}(time)} = (alpha\_m * (1.0 - m) - beta\_m * m)$$

5 “sodium_channel_h_gate” component

alpha_h_calculation

$$alpha\_h = 0.07 * e^{\frac{V}{20.0}}$$

beta_h_calculation

$$beta\_h = \frac{1.0}{\left(e^{0.1*(V+30.0)} + 1.0\right)}$$

dh_dt

$$\frac{\mathrm{d}(h)}{\mathrm{d}(time)} = (alpha\_h * (1.0 - h) - beta\_h * h)$$

6 “potassium_channel” component

E_K_calculation

$$E\_K = (E\_R - 12.0)$$

i_K_calculation

$$i\_K = g\_K * (n)^{4.0} * (V - E\_K)$$

7 “potassium_channel_n_gate” component

alpha_n_calculation

$$alpha\_n = \frac{0.01 * (V + 10.0)}{\left(e^{0.1*(V+10.0)} - 1.0\right)}$$

beta_n_calculation

$$beta\_n = 0.125 * e^{\frac{V}{80.0}}$$

dn_dt

$$\frac{\mathrm{d}(n)}{\mathrm{d}(time)} = (alpha\_n * (1.0 - n) - beta\_n * n)$$

8 “leakage_current” component

E_L_calculation

$$E\_L = (E\_R + 10.613)$$

i_L_calculation

$$i\_L = g\_L * (V - E\_L)$$