

1 “environment” component

This component has no equations.

2 “membrane” component

membrane_voltage_diff_eq

$$\frac{d(V)}{d(time)} = \frac{-((i_{K_dr} + i_{K_Ca} + i_{K_ATP} + i_{fast} + i_{Ca} + i_{NS} + i_{NaL}))}{Cm}$$

3 “fast_current” component

i_fast_calculation

$$i_{fast} = g_{fast} * (m_{infinity})^{3.0} * h * (V - V_{fast})$$

4 “fast_current_m_gate” component

m_infinity_calculation

$$m_{infinity} = \frac{1.0}{\left(1.0 + e^{\frac{(V-V_m)}{S_m}}\right)}$$

5 “fast_current_h_gate” component

h_diff_eq

$$\frac{d(h)}{d(time)} = \frac{(h_{infinity} - h)}{\tau_{h}}$$

h_infinity_calculation

$$h_infinity = \frac{1.0}{\left(1.0 + e^{\frac{(V-V_h)}{S_h}}\right)}$$

tau_h_calculation

$$tau_h = \frac{1.0}{lamda_h * \left(e^{\frac{(V_h-V)}{2.0*S_h}} + e^{\frac{(V-V_h)}{2.0*S_h}}\right)}$$

6 “calcium_current” component

i_Ca_calculation

$$i_Ca = P_Ca * d * f_infinity * \frac{2.0 * F * V}{R * T} * \frac{\left(Ca_o - Ca_i * e^{\frac{2.0*F*V}{R*T}}\right)}{\left(1.0 - e^{\frac{2.0*F*V}{R*T}}\right)}$$

7 “calcium_current_d_gate” component

d_diff_eq

$$\frac{d(d)}{d(time)} = \frac{(d_infinity - d)}{tau_d}$$

d_infinity_calculation

$$d_infinity = \frac{1.0}{\left(1.0 + e^{\frac{(V-V_d)}{S_d}}\right)}$$

tau_d_calculation

$$tau_d = \frac{1.0}{lamda_d * \left(e^{\frac{(V_d-V)}{2.0*S_d}} + e^{\frac{(V-V_d)}{2.0*S_d}}\right)}$$

8 “calcium_current_f_gate” component

f_infinity_calculation

$$f_infinity = \frac{K_Ca}{(K_Ca + Ca_i)}$$

9 “cationic_nonspecific_inward_current” component

i_NS_calculation

$$i_{NS} = g_{NS} * \frac{(K_{NS})^{2.0}}{\left((K_{NS})^{2.0} + (Ca_{lum})^{2.0} \right)} * \left(\frac{(V - V_{NS})}{(1.0 - e^{0.1 * (V_{NS} - V)})} - 10.0 \right)$$

10 “delayed_rectifier_K_channel_current” component

i_K_dr_calculation

$$i_{K_dr} = g_{K_dr} * n * (V - V_K)$$

11 “delayed_rectifier_K_channel_current_n_gate” component

n_diff_eq

$$\frac{d(n)}{d(time)} = \frac{(n_infinity - n)}{tau_n}$$

n_infinity_calculation

$$n_infinity = \frac{1.0}{\left(1.0 + e^{\frac{(V - V_n)}{S_n}} \right)}$$

tau_n_calculation

$$tau_n = \frac{1.0}{lamda_n * \left(e^{\frac{(V_n - V)}{2.0 * S_n}} + e^{\frac{(V - V_n)}{2.0 * S_n}} \right)}$$

12 “Ca_sensitive_K_current” component

i_K_Ca_calculation

$$i_{K_Ca} = g_{K_Ca} * \frac{(Ca_i)^{3.0}}{\left((K_{Ca})^{3.0} + (Ca_i)^{3.0} \right)} * (V - V_K)$$

13 “ATP_sensitive_K_current” component

i_K_ATP_calculation

$$i_{K_ATP} = g_{K_ATP} * (V - V_K)$$

14 “Na_leak_current” component

i_NaL_calculation

$$i_{NaL} = g_{NaL} * (V - V_{Na})$$

15 “cytosolic_calcium” component

Ca_i_diff_eq

$$\frac{d(Ca_i)}{d(time)} = (k_{rel} * (Ca_{lum} - Ca_i) - (\omega * i_{Ca} + k_{Ca} * Ca_i + k_{pump} * Ca_i))$$

Ca_lum_diff_eq

$$\frac{d(Ca_{lum})}{d(time)} = -(k_{rel} * (Ca_{lum} - Ca_i) + k_{pump} * Ca_i)$$