tran_2009

1 "environment" component

This component has no equations.

2 "sarcomere_geometry" component

$$sovr\_ze = \begin{cases} \frac{len\_thick}{2}; & \text{if } \frac{len\_thick}{2} < \frac{SL}{2}, \\ \frac{SL}{2} & \text{otherwise.} \end{cases}$$

$$sovr\_cle = \begin{cases} \left(\frac{SL}{2} - (SL - len\_thin)\right); & \text{if } \left(\frac{SL}{2} - (SL - len\_thin)\right) > \frac{len\_hbare}{2}, \\ \frac{len\_hbare}{2} & \text{otherwise.} \end{cases}$$

$$len\_sovr = (sovr\_ze - sovr\_cle)$$

$$SOVFThick = \frac{len\_sovr * 2}{(len\_thick - len\_hbare)}$$

$$SOVFThin = \frac{len\_sovr}{len\_thin}$$

3 "Ca_binding_to_troponin_to_thin_filament_regulation" component

$$konT = \frac{((kdHCa)^m + (H\_cons)^m)}{((kdHCa)^m + (H)^m)} * kon * (Qkon)^{\frac{(TmpC-37)}{10}}$$

$$H = 106 * (10)^{-(pH)}$$

$$H\_cons = 106 * (10)^{-7.15}$$

$$koffLT = koffL * koffmod * (Qkoff)^{\frac{(TmpC-37)}{10}}$$

$$koffHT = koffH * koffmod * (Qkoff)^{\frac{(TmpC-37)}{10}}$$

$$kn\_pT = kn\_p * permtot * (Qkn\_p)^{\frac{(TmpC-37)}{10}}$$

$$kp\_nT = kp\_n * inprmt * (Qkp\_n)^{\frac{(TmpC-37)}{10}}$$

$$permtot = \sqrt{|\frac{1}{\left(1 + \left(\frac{perm50}{Tropreg}\right)^{nperm}\right)}|}$$

$$inprmt = \begin{cases} \frac{1}{permtot}; & \text{if } \frac{1}{permtot} < 100, \\ 100 & \text{otherwise.} \end{cases}$$

$$\frac{\mathrm{d}(TRPNCaL)}{\mathrm{d}(time)} = dTRPNCaL$$

$$dTRPNCaL = (konT * Cai * (1 - TRPNCaL) - koffLT * TRPNCaL)$$

$$\frac{\mathrm{d}(TRPNCaH)}{\mathrm{d}(time)} = dTRPNCaH$$

$$dTRPNCaH = (konT * Cai * (1 - TRPNCaH) - koffHT * TRPNCaH)$$

$$Tropreg = ((1 - SOVFThin) * TRPNCaL + SOVFThin * TRPNCaH)$$

4 "thin_filament_regulation_and_crossbridge_cycling_rates" component

$$fappT = fapp * xbmodsp * (Qfapp)^{\frac{(TmpC-37)}{10}}$$

$$gapslmd = (1 + (1 - SOVFThick) * gslmod)$$

$$gappT = gapp * gapslmd * xbmodsp * (Qgapp)^{\frac{(TmpC-37)}{10}}$$

$$hfmd = e^{\frac{-(xXBprer)}{|xXBprer|} * hfmdc * \left(\frac{xXBprer}{x\_0}\right)^2}$$

$$hbmd = e^{\frac{(xXBpostr-x\_0)}{|(xXBpostr-x\_0)|} * hbmdc * \left(\frac{(xXBpostr-x\_0)}{x\_0}\right)^2}$$

$$hfT = hf * hfmd * xbmodsp * (Qhf)^{\frac{(TmpC-37)}{10}}$$

$$hbT = hb * hbmd * xbmodsp * (Qhb)^{\frac{(TmpC-37)}{10}}$$

$$gxbmd = \begin{cases} e^{sigmap * \left(\frac{(x\_0-xXBpostr)}{x\_0}\right)^2}; & \text{if } xXBpostr < x\_0, \\ e^{sigman * \left(\frac{(xXBpostr-x\_0)}{x\_0}\right)^2} & \text{otherwise.} \end{cases}$$

$$gxbT = gxb * gxbmd * xbmodsp * (Qgxb)^{\frac{(TmpC-37)}{10}}$$

5 "regulation_and_crossbridge_cycling_state_equations" component

$$\frac{\mathrm{d}(N\_NoXB)}{\mathrm{d}(time)} = (kp\_nT * P\_NoXB - kn\_pT * N\_NoXB)$$

$$\frac{\mathrm{d}(P\_NoXB)}{\mathrm{d}(time)} = (kn\_pT * N\_NoXB - kp\_nT * P\_NoXB)$$

$$N = (1 - (P + XBprer + XBpostr))$$

$$\frac{\mathrm{d}(P)}{\mathrm{d}(time)} = (kn\_pT * N - (kp\_nT + alpha1\_plus) * P)$$

$$\frac{\mathrm{d}(XBprer)}{\mathrm{d}(time)} = dXBprer$$

$$dXBprer = ((alpha1\_plus * P + alpha2\_minus * XBpostr) - (alpha1\_minus + alpha2\_plus) * XBprer)$$

$$\frac{\mathrm{d}(XBpostr)}{\mathrm{d}(time)} = dXBpostr$$

$$dXBpostr = ((alpha3\_minus * P + alpha2\_plus * XBprer) - (alpha2\_minus + alpha3\_plus) * XBpostr)$$

$$alpha1\_plus = fappT$$

$$alpha2\_plus = hfT$$

$$alpha3\_plus = MgATP * \frac{gxbT}{MgATP\_cons} * \frac{(kdADP + MgADP\_cons)}{(kdADP + MgADP)}$$

$$alpha1\_minus = xPi * \frac{gappT}{xPi\_cons}$$

$$alpha2\_minus = H * \frac{hbT}{H\_cons} * \frac{(kdADP + MgADP\_cons)}{MgADP\_cons} * \frac{MgADP}{(kdADP + MgADP)}$$

$$alpha3\_minus = fxbT$$

$$fxbT = \frac{kdADP * fappT * hfT * \frac{gxbT}{MgATP\_cons}}{\frac{gappT}{xPi\_cons} * \frac{hbT}{H\_cons} * kMgATP}$$

6 "mean_strain_of_strongly_bound_states" component

$$\frac{\mathrm{d}(xXBprer)}{\mathrm{d}(time)} = dxXBprer$$

$$dxXBprer = \left(\frac{dSL}{2} + \frac{xPsi}{dutyprer} * (-(alpha1\_plus * xXBprer) + alpha2\_minus * (xXBpostr - (x\_0 + xXBprer)))\right)$$

$$\frac{\mathrm{d}(xXBpostr)}{\mathrm{d}(time)} = dxXBpostr$$

$$dxXBpostr = \left(\frac{dSL}{2} + \frac{xPsi}{dutypostr} * alpha2\_plus * ((xXBprer + x\_0) - xXBpostr)\right)$$

$$dutyprer = \frac{(alpha3\_minus * alpha2\_minus + alpha3\_plus * alpha1\_plus + alpha}{(alpha1\_plus * alpha2\_plus + alpha3\_minus * alpha1\_minus + alpha3\_minus * alpha2\_plus + alpha3\_minus * alpha2\_minus + alpha3\_plus * alpha1\_plus + alpha}$$

$$dutypostr = \frac{(alpha1\_plus * alpha2\_plus + alpha3\_minus * alpha1\_minus + alph}{(alpha1\_plus * alpha2\_plus + alpha3\_minus * alpha1\_minus + alpha3\_minus * alpha2\_plus + alpha3\_minus * alpha2\_minus + alpha3\_plus * alpha1\_plus + alph}$$

7 "normalised_active_and_passive_force" component

$$fxb = \frac{kdADP * fapp * hf * \frac{gxb}{MgATP\_cons}}{\frac{gapp}{xPi\_cons} * \frac{hb}{H\_cons} * kMgATP}$$

$$SSXBprer = \frac{(fxb * hb + gxb * fapp + hbT * fapp)}{(hf * gxb + hb * gapp + gxb * gapp + fxb * hb + gxb * fapp + hb * fapp + fxb * gapp + fapp * hf + fxb * hb)}$$

$$SSXBpostr = \frac{(fapp * hf + fxb * gapp + fxb * hb)}{(hf * gxb + hb * gapp + gxb * gapp + fxb * hb + gxb * fapp + hb * fapp + fxb * gapp + fapp * hf + fxb * hb)}$$

$$Fnordv = kxb * x\_0 * SSXBpostr$$

$$force = kxb * SOVFThick * (xXBpostr * XBpostr + xXBprer * XBprer)$$

$$active = \frac{1 * force}{Fnordv}$$

$$ppforce\_t = \frac{(SL - SLrest)}{|\,(SL - SLrest)\,|} * PCon\_t * \left(e^{PExp\_t * |(SL - SLrest)|} - 1\right)$$

$$ppforce\_c = \begin{cases} PCon\_c * \left(e^{PExp\_c * |(SL - SL\_c)|} - 1\right); & \text{if } SL > SL\_c, \\ 0 & \text{otherwise.} \end{cases}$$

$$ppforce = (ppforce\_t + ppforce\_c)$$

$$preload = \frac{|\,(SLset - SLrest)\,|}{(SLset - SLrest)} * PCon\_t * \left(e^{PExp\_t * |(SLset - SLrest)|} - 1\right)$$

$$afterload = \begin{cases} KSE * (SLset - SL); & \text{if } SEon = 1, \\ 0 & \text{otherwise.} \end{cases}$$

$$\frac{\mathrm{d}(SL)}{\mathrm{d}(time)} = dSL$$

$$dSL = 0$$

$$\frac{\mathrm{d}(intf)}{\mathrm{d}(time)} = ((preload + afterload) - (ppforce + active))$$

8 "calculation_of_micromolar_per_millisecondes_of_Ca_for_apparent_Ca_binding" component

$$FrSBXB = \frac{(XBpostr + XBprer)}{(SSXBpostr + SSXBprer)}$$

$$dFrSBXB = \frac{(dXBpostr + dXBprer)}{(SSXBpostr + SSXBprer)}$$

$$dsovr\_ze = \begin{cases} -(0.5) * dSL; & \text{if } SL < len\_thick, \\ 0 & \text{otherwise.} \end{cases}$$

$$dsovr\_cle = \begin{cases} -(0.5) * dSL; & \text{if } (2 * len\_thin - SL) > len\_hbare, \\ 0 & \text{otherwise.} \end{cases}$$

$$dlen\_sovr = (dsovr\_ze - dsovr\_cle)$$

$$dSOVFThin = \frac{dlen\_sovr}{len\_thin}$$

$$dSOVFThick = \frac{2 * dlen\_sovr}{(len\_thick - len\_hbare)}$$

$$TropTot = Trop\_conc*((1 - SOVFThin) * TRPNCaL + SOVFThin * (FrSBXB * TRPNCaH + (1 - FrSBXB) * TRPNCaL))$$

$$dTropTot = Trop\_conc*(-(dSOVFThin) * TRPNCaL + (1 - SOVFThin) * dTRPNCaL + dSOVFThin * (FrSBXB * TRPNCaH + (1 - FrSBXB) * TRPNCaL) + S$$

$$dforce = (kxb * dSOVFThick * (xXBpostr * XBpostr + xXBprer * XBprer) + kxb * SOVFThick * (dxXBpostr * XBpostr + xXBpostr * dXBpostr + dxXBprer * XBp$$

9 "model_parameters" component

This component has no equations.