SBML Model Report

Model name: "Golomb2006_SomaticBursting"

May 6, 2016

1 General Overview

This is a document in SBML Level 2 Version 1 format. This model was created by Enuo He[1] at June sixth 2007 at 2:28 p. m. and last time modified at July fifth 2012 at 4:50 p. m. Table 1 shows an overview of the quantities of all components of this model.

Table 1: Number of components in this model, which are described in the following sections.

Element	Quantity	Element	Quantity
compartment types	0	compartments	1
species types	0	species	0
events	0	constraints	0
reactions	0	function definitions	1
global parameters	45	unit definitions	2
rules	13	initial assignments	0

Model Notes

Model is according to the paper *Contribution of Persistent Na+ Current and M-Type K+ Current to Somatic Bursting in CA1 Pyramidal Cell: Combined Experimental. Figure6Da has been reproduced by MathSBML. The original model from ModelDB.* http://senselab.med.yale.edu/modeldb/

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2 Unit Definitions

This is an overview of six unit definitions of which four are predefined by SBML and not mentioned in the model.

2.1 Unit `time`

Name ms

Definition ms

2.2 Unit `mV`

Definition mV

2.3 Unit `substance`

Notes Mole is the predefined SBML unit for `substance`.

Definition mol

2.4 Unit `volume`

Notes Litre is the predefined SBML unit for `volume`.

Definition l

2.5 Unit `area`

Notes Square metre is the predefined SBML unit for `area` since SBML Level 2 Version 1.

Definition m^2

2.6 Unit length

Notes Metre is the predefined SBML unit for length since SBML Level 2 Version 1.

Definition m

3 Compartment

This model contains one compartment.

Table 2: Properties of all compartments.

Id	Name	SBO	Spatial Dimensions	Size	Unit	Constant	Outside
compartment_0000001			3	1	litre	☑	

3.1 Compartment compartment_0000001

This is a three dimensional compartment with a constant size of one litre.

4 Parameters

This model contains 45 global parameters.

Table 3: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
Cm			1.000		☑
pms			3.000		☑
pns			4.000		☑
VNa			55.000		☑
t_tauh			−40.500		☑
t_taun			−27.000		☑
thetaa			−50.000		☑
sigmaa			20.000		☑
thetab			−80.000		☑
sigmab			−6.000		☑
tauBs			15.000		☑
sigmam			9.500		☑
sigmah			−7.000		☑
sigman			10.000		☑
sigmaz			5.000		☑
gNa			35.000		☑

Id	Name	SBO	Value	Unit	Constant
gKdr			6.000		☑
gL			0.050		☑
Iapp			0.662		☑
gA			1.400		☑
gNaP			0.300		☑
gZ			1.000		☑
thetaz			−39.000		☑
tauZs			75.000		☑
phi			10.000		☑
thetah			−45.000		☑
thetam			−30.000		☑
thetan			−35.000		☑
thetap			−47.000		☑
sigmap			3.000		☑
VK			−90.000		☑
VL			−70.000		☑
INa			0.000		☐
INaP			0.000		☐
IKdr			0.000		☐
IA			0.000		☐
Iz			0.000		☐
Minfs			0.000		☐
Pinfs			0.000		☐
Ainfs			0.000		☐
zzs			0.001		☐
bbs			0.204		☐
nns			0.025		☐
hhs			0.988		☐
V	VVs		−71.813		☐

5 Function definition

This is an overview of one function definition.

5.1 Function definition GAMMAF

Arguments VV, theta, sigma

Mathematical Expression

$$\frac{1}{1+\exp\left(\frac{(\mathrm{VV}-\mathrm{theta})}{\mathrm{sigma}}\right)} \tag{1}$$

6 Rules

This is an overview of 13 rules.

6.1 Rule `Minfs`

Rule `Minfs` is an assignment rule for parameter `Minfs`:

$$\text{Minfs} = \text{GAMMAF}(\text{V}, \text{thetam}, \text{sigmam}) \tag{2}$$

6.2 Rule `Pinfs`

Rule `Pinfs` is an assignment rule for parameter `Pinfs`:

$$\text{Pinfs} = \text{GAMMAF}(\text{V}, \text{thetap}, \text{sigmap}) \tag{3}$$

6.3 Rule `Ainfs`

Rule `Ainfs` is an assignment rule for parameter `Ainfs`:

$$\text{Ainfs} = \text{GAMMAF}(\text{V}, \text{thetaa}, \text{sigmaa}) \tag{4}$$

6.4 Rule `IA`

Rule `IA` is an assignment rule for parameter `IA`:

$$\text{IA} = \text{gA} \cdot \text{Ainfs}^3 \cdot \text{bbs} \cdot (\text{V} - \text{VK}) \tag{5}$$

6.5 Rule `Iz`

Rule `Iz` is an assignment rule for parameter `Iz`:

$$\text{Iz} = \text{gZ} \cdot \text{zzs} \cdot (\text{V} - \text{VK}) \tag{6}$$

6.6 Rule `INa`

Rule `INa` is an assignment rule for parameter `INa`:

$$\text{INa} = \text{gNa} \cdot \text{Minfs}^{\text{pms}} \cdot \text{hhs} \cdot (\text{V} - \text{VNa}) \tag{7}$$

6.7 Rule `INaP`

Rule `INaP` is an assignment rule for parameter `INaP`:

$$\text{INaP} = \text{gNaP} \cdot \text{Pinfs} \cdot (\text{V} - \text{VNa}) \tag{8}$$

6.8 Rule `IKdr`

Rule `IKdr` is an assignment rule for parameter `IKdr`:

$$\mathrm{IKdr} = \mathrm{gKdr} \cdot \mathrm{nns}^{\mathrm{pns}} \cdot (\mathrm{V} - \mathrm{VK}) \tag{9}$$

6.9 Rule `zzs`

Rule `zzs` is a rate rule for parameter `zzs`:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{zzs} = \frac{\mathrm{GAMMAF}(\mathrm{V}, \mathrm{thetaz}, \mathrm{sigmaz}) - \mathrm{zzs}}{\mathrm{tauZs}} \tag{10}$$

6.10 Rule `bbs`

Rule `bbs` is a rate rule for parameter `bbs`:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{bbs} = \frac{\mathrm{GAMMAF}(\mathrm{V}, \mathrm{thetab}, \mathrm{sigmab}) - \mathrm{bbs}}{\mathrm{tauBs}} \tag{11}$$

6.11 Rule `hhs`

Rule `hhs` is a rate rule for parameter `hhs`:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{hhs} = \frac{\mathrm{phi} \cdot (\mathrm{GAMMAF}(\mathrm{V}, \mathrm{thetah}, \mathrm{sigmah}) - \mathrm{hhs})}{1 + 7.5 \cdot \mathrm{GAMMAF}(\mathrm{V}, \mathrm{t\_tauh}, -6)} \tag{12}$$

6.12 Rule `V`

Rule `V` is a rate rule for parameter `V`:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{V} = \frac{\mathrm{gL} \cdot (\mathrm{V} - \mathrm{VL}) - \mathrm{INa} - \mathrm{INaP} - \mathrm{IKdr} - \mathrm{IA} - \mathrm{Iz} + \mathrm{Iapp}}{\mathrm{Cm}} \tag{13}$$

6.13 Rule `nns`

Rule `nns` is a rate rule for parameter `nns`:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{nns} = \frac{\mathrm{phi} \cdot (\mathrm{GAMMAF}(\mathrm{V}, \mathrm{thetan}, \mathrm{sigman}) - \mathrm{nns})}{1 + 5 \cdot \mathrm{GAMMAF}(\mathrm{V}, \mathrm{t\_taun}, -15)} \tag{14}$$

SBML2LaTeX was developed by Andreas Dräger[a], Hannes Planatscher[a], Dieudonné M Wouamba[a], Adrian Schröder[a], Michael Hucka[b], Lukas Endler[c], Martin Golebiewski[d] and Andreas Zell[a]. Please see http://www.ra.cs.uni-tuebingen.de/software/SBML2LaTeX for more information.

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