# SED-ML

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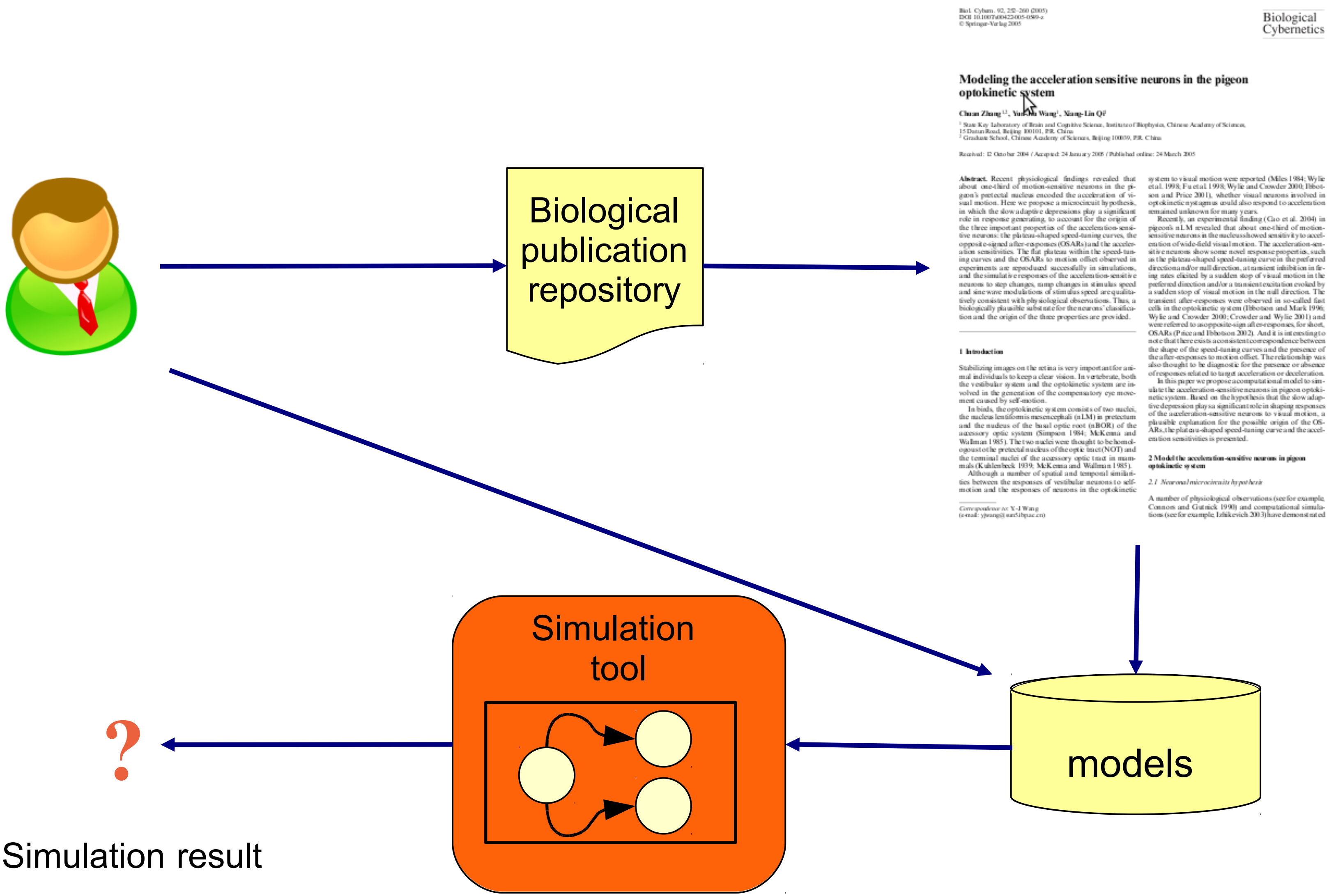
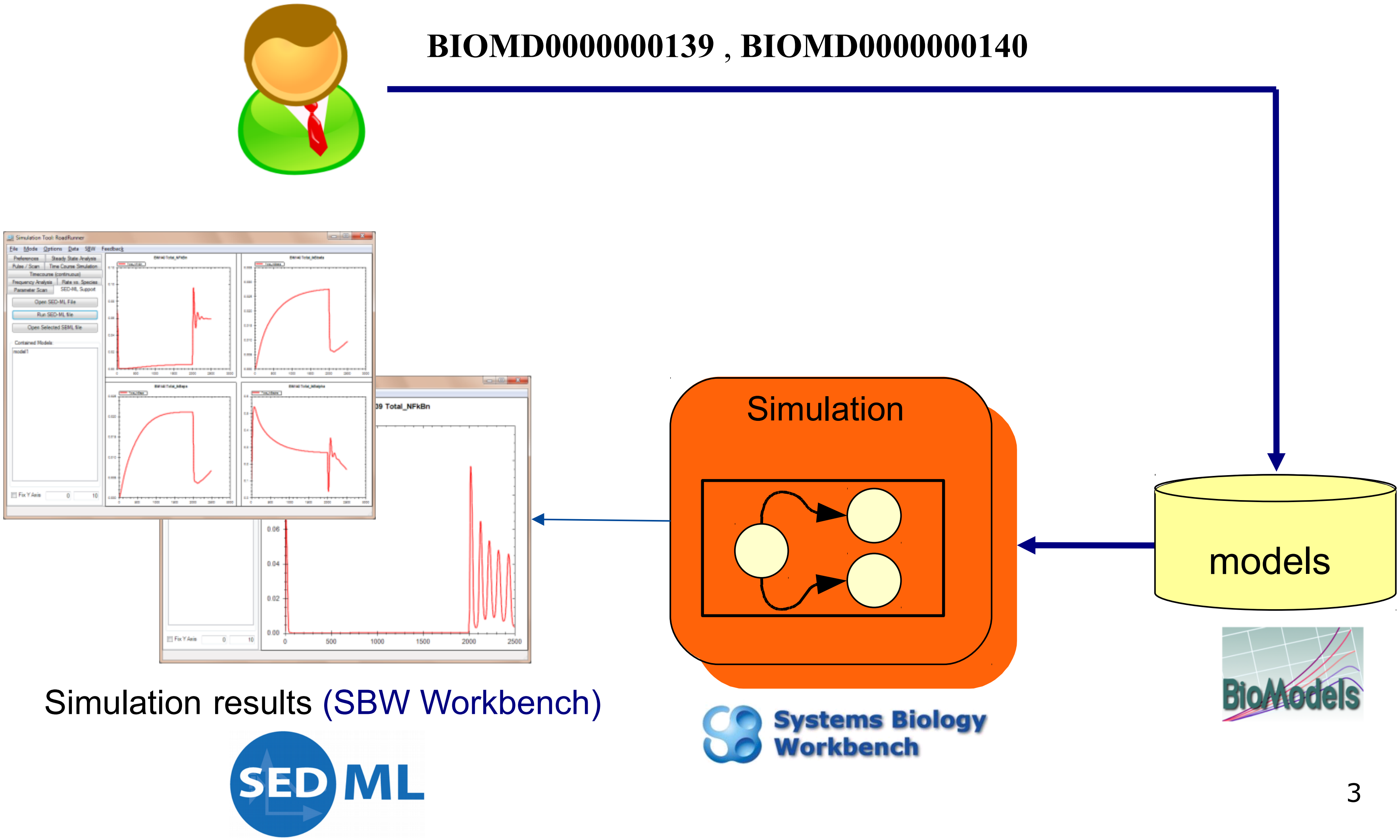
[3]California Institute of Technology

# SED-ML Motivation



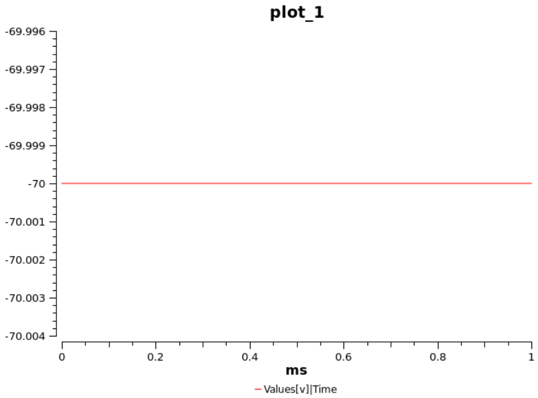
# SED-ML Motivation



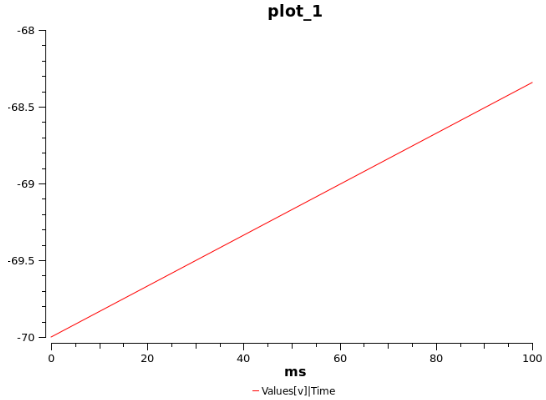
# Example

First attempt to run the model, measuring the spiking rate *v* over time

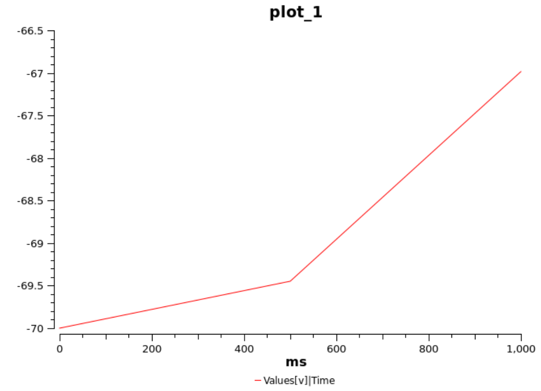
- load SBML into the simulation tool COPASI
- use parametrisation as given in the SBML file
- define output variables (**v**)
- run the time course




1 ms (standard)



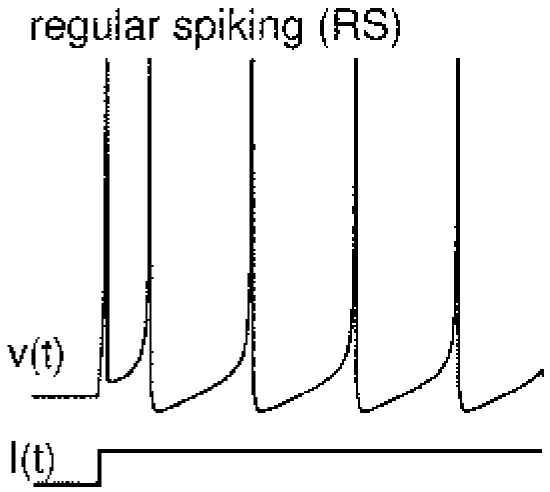

100ms




1000ms

# Example

Second attempt to run the model, adjusting simulation step size and duration



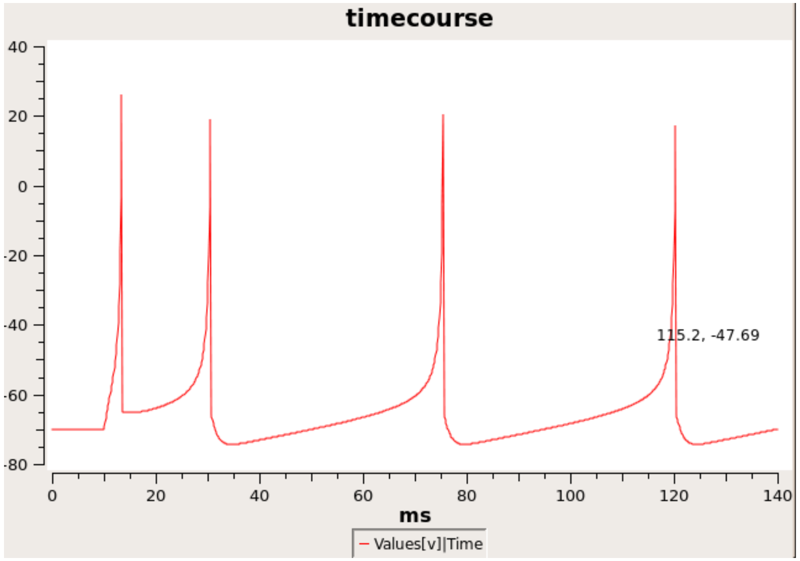
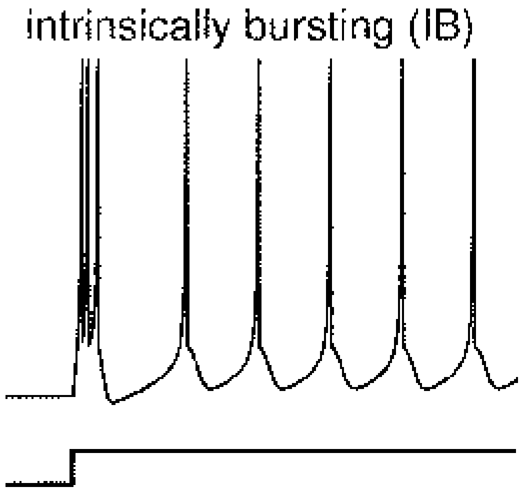




Fig.: COPASI simulation, duration: 140ms, step size: 0.14

# Example

Third attempt to run the model, updating initial model  parameters



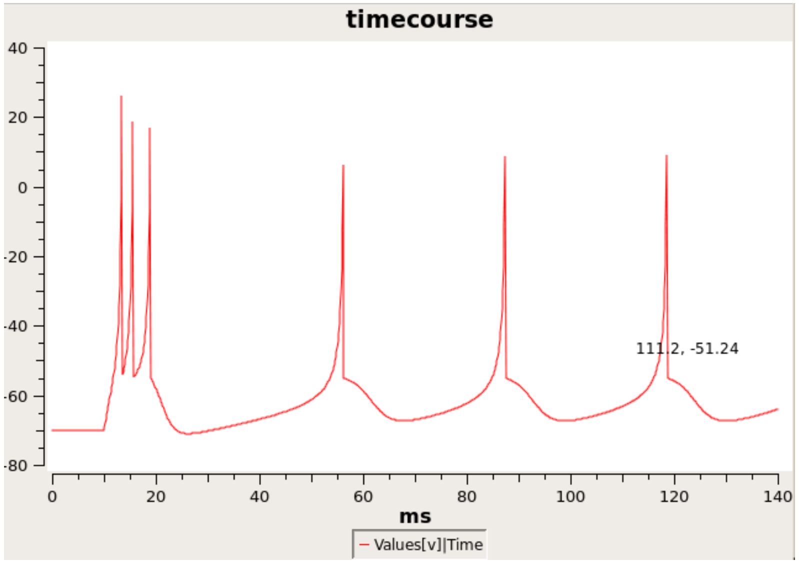
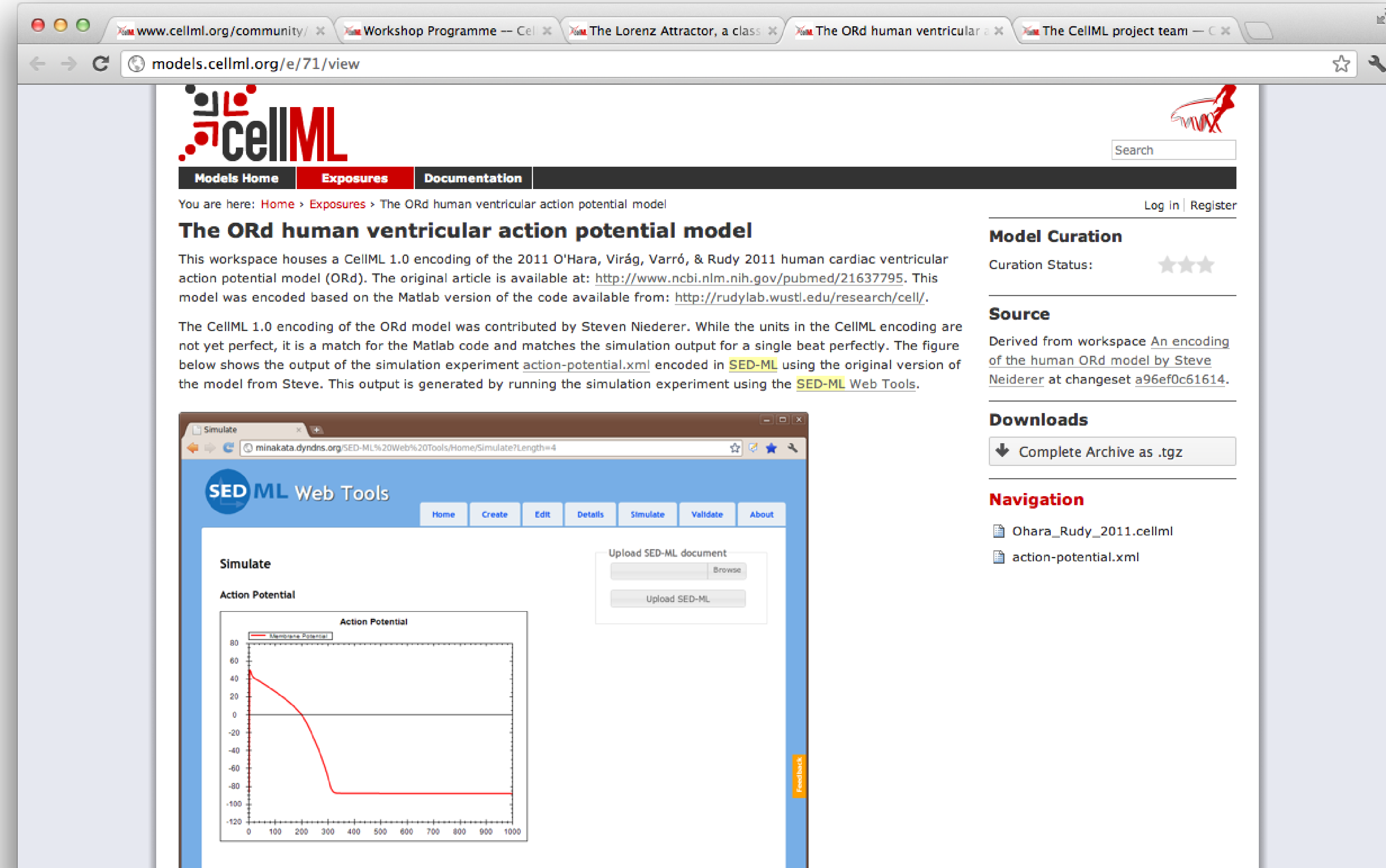




Fig.: COPASI, adjusted parameter values (a=0.02, b=0.2 **c=-55, d=4**)

# Example



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The Lorenz Attractor, a class
The ORd human ventricular
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The ORd human ventricular action potential model
This workspace houses a CellML 1.0 encoding of the 2011 O'Hara, Virág, Varró, & Rudy 2011 human cardiac ventricular action potential model (ORd). The original article is available at: http://www.ncbi.nlm.nih.gov/pubmed/21637795. This model was encoded based on the Matlab version of the code available from: http://rudylab.wustl.edu/research/cell/.
The CellML 1.0 encoding of the ORd model was contributed by Steven Niederer. While the units in the CellML encoding are not yet perfect, it is a match for the Matlab code and matches the simulation output for a single beat perfectly. The figure below shows the output of the simulation experiment action-potential.xml encoded in SED-ML using the original version of the model from Steve. This output is generated by running the simulation experiment using the SED-ML Web Tools.
Model Curation
Curation Status:
Source
Derived from workspace An encoding of the human ORd model by Steve Neiderer at changeset a96ef0c61614.
Downloads
Complete Archive as .tgz
Navigation
Ohara_Rudy_2011.cellml
action-potential.xml
Simulate
minakata.dyndns.org/SED-ML%20Web%20Tools/Home/Simulate?Length=4
SED ML Web Tools
Home
Create
Edit
Details
Simulate
Validate
About
Simulate
Action Potential
Upload SED-ML document
Browse
Upload SED-ML
Action Potential
Membrane Potential
80
60
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20
0
-20
-40
-60
-80
-100
-120
0
100
200
300
400
500
600
700
800
900
1000
Feedback

# Exa

CellML

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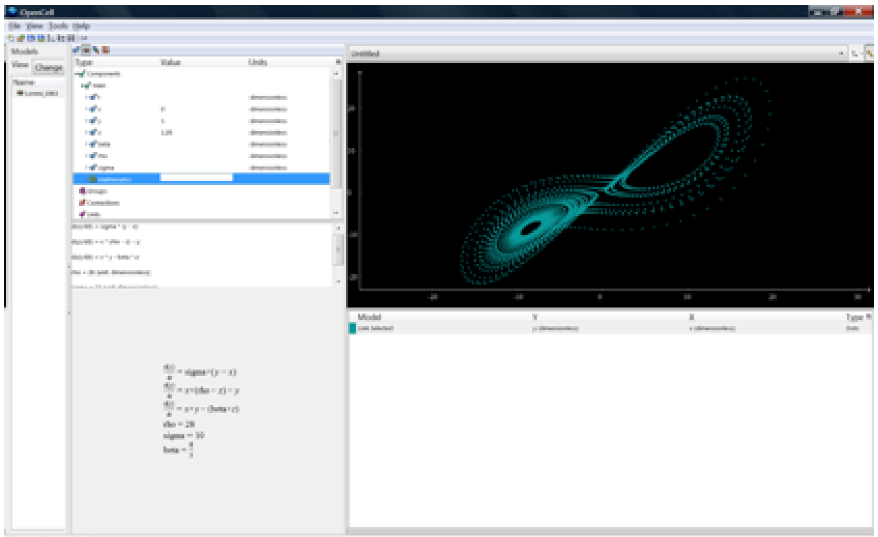
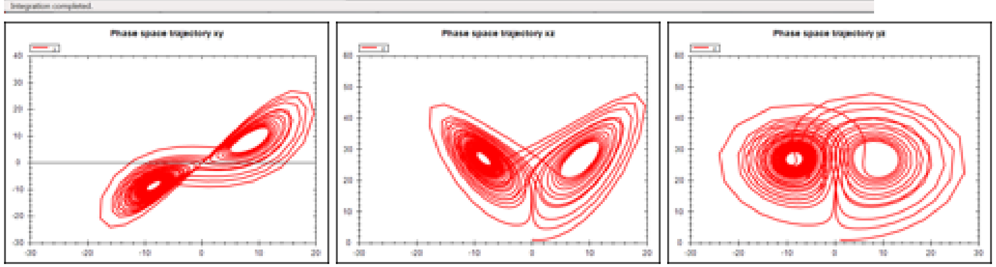
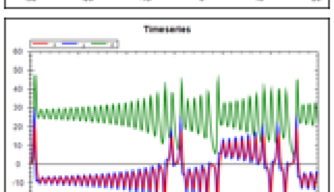
## The Lorenz Attractor, a classical mathematical model

This workspace houses a CellML encoding of the 1963 Lorenz model which became a well-known demonstration of deterministic chaos. The original article DOI is 10.1175/1520-0469(1963)020<0130:DNF>2.0.CO;2. This model was encoded based on the Octave code available in the related Wikipedia article.

An OpenCell 0.8 session file is available. SED-ML can also be used to simulate this model, the simulation description is in Lorenz_1963_sedml.xml, and the simulation experiment can be run using the SED-ML Web Tools. The figures below show the results fro OpenCell and from using SED-ML.






### Model Curation

Curation Status:

OpenCell:

### Source

Derived from workspace Deterministic Nonperiodic Flow at changeset 1cdf5c612924.

### Downloads

Complete Archive as .tgz

### Navigation

The Lorenz Attractor, a classical mathematical model

# SED-ML Level 1 Version 1

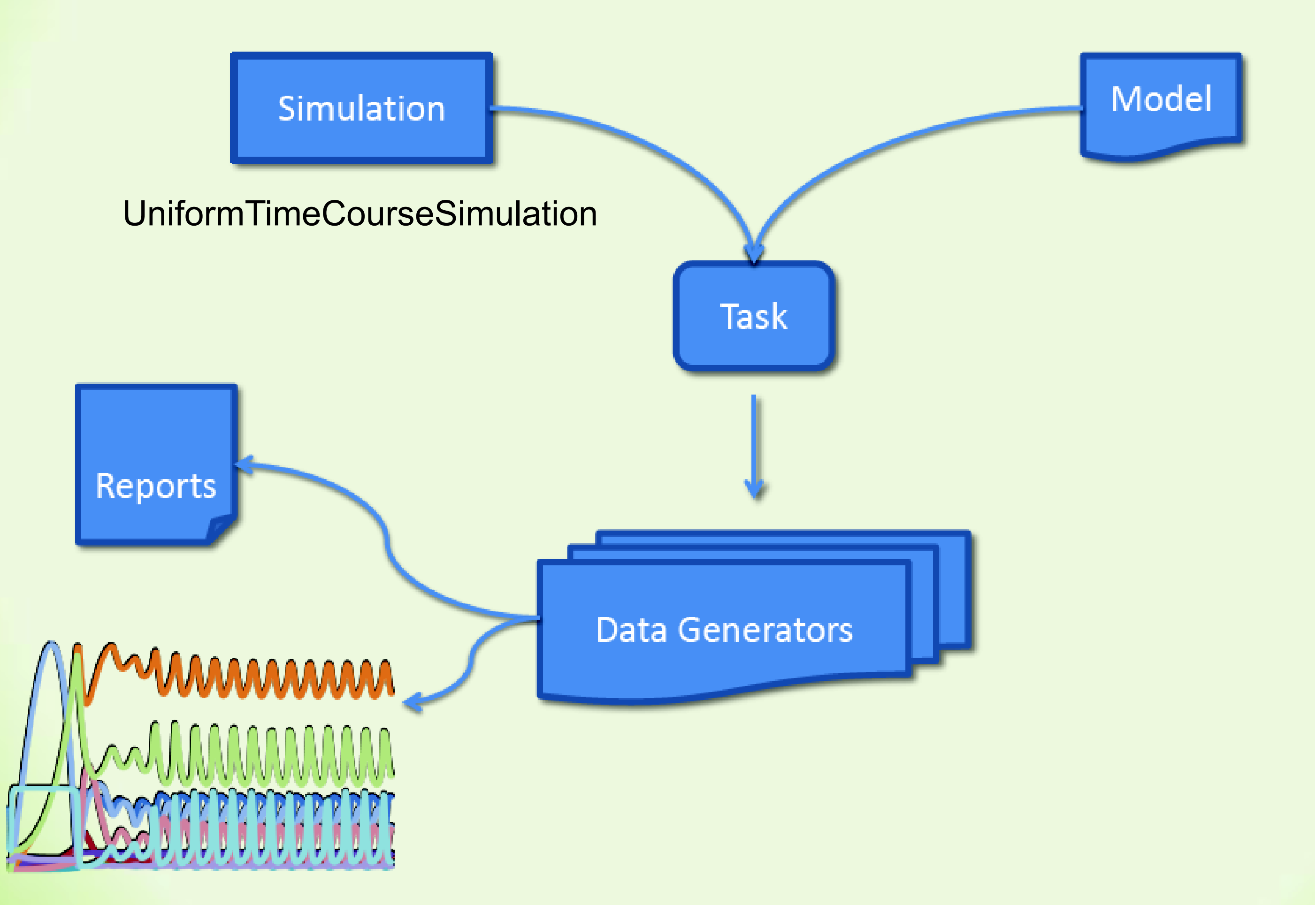
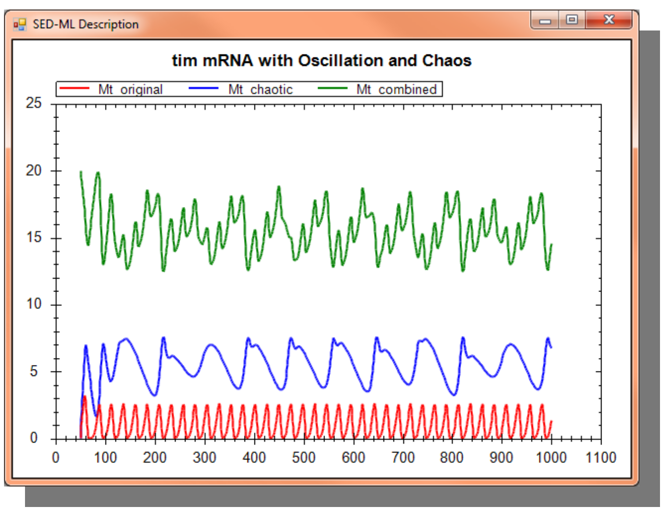
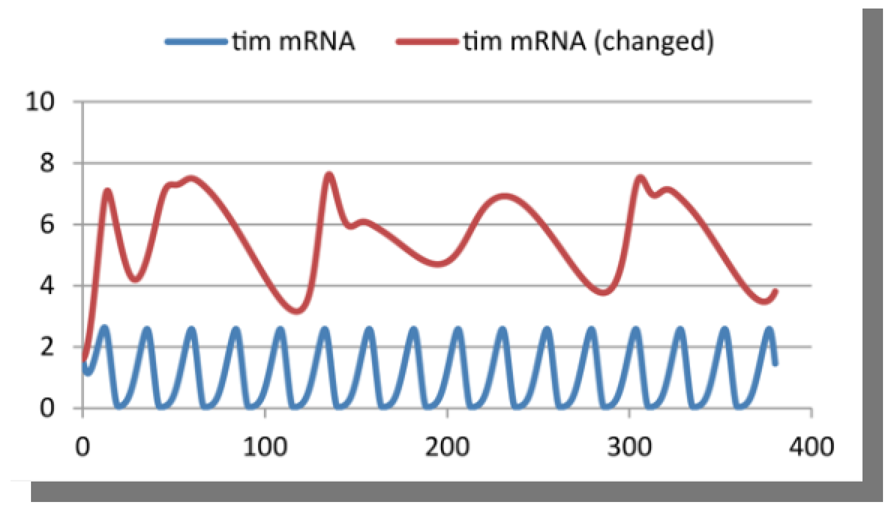



Figure: SED-ML structure *(Waltemath et al., 2011)*

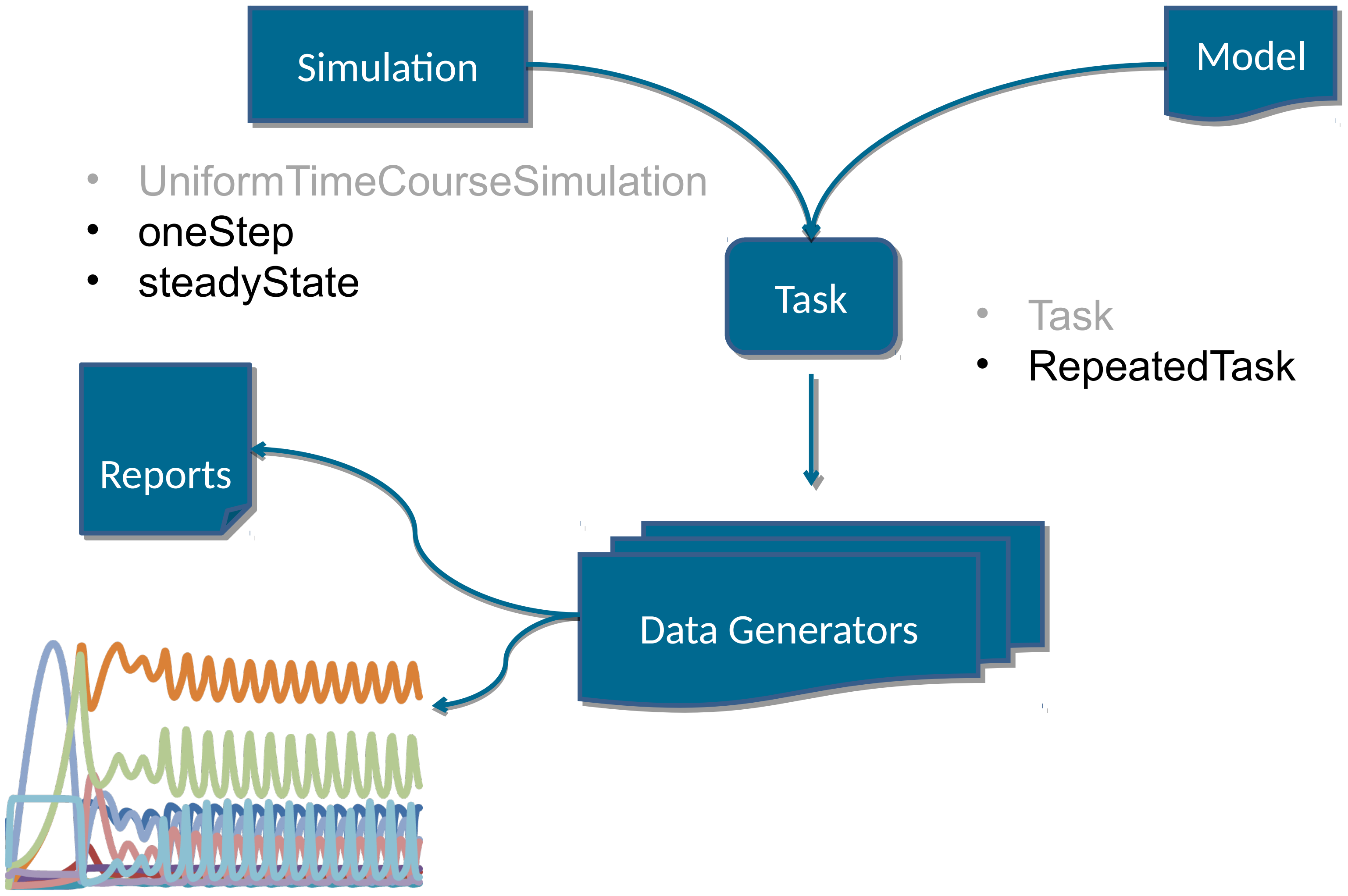
# SED-ML Level 1 Version 1

- Carry out multiple time course simulations
- Collect results from these simulations
- Combine results from these simulations
- Report / Graph the results



# SED-ML Level 1 Version 2

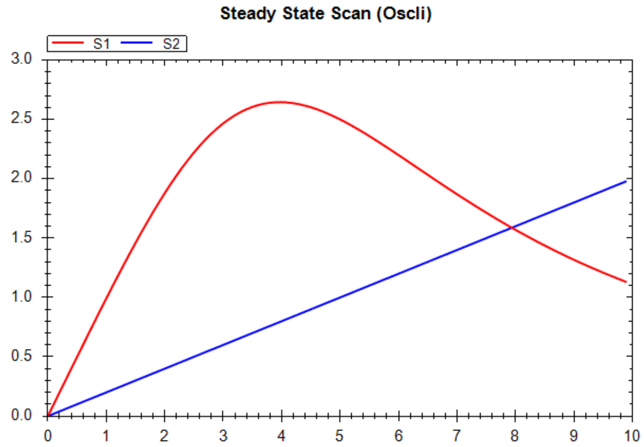



- UniformTimeCourseSimulation
- oneStep
- steadyState

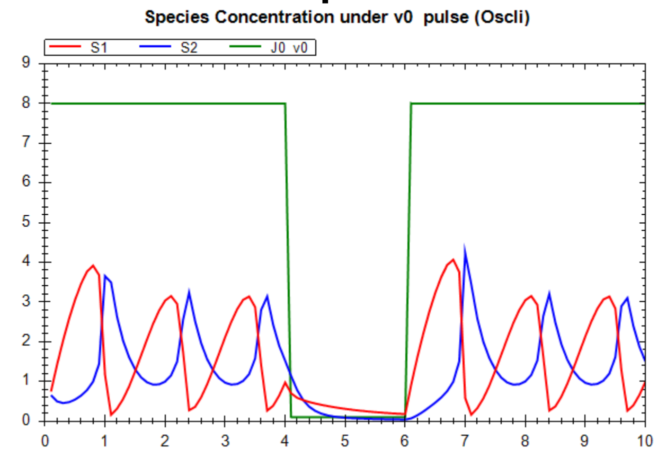
- Task
- RepeatedTask

# SED-ML Level 1 Version 2

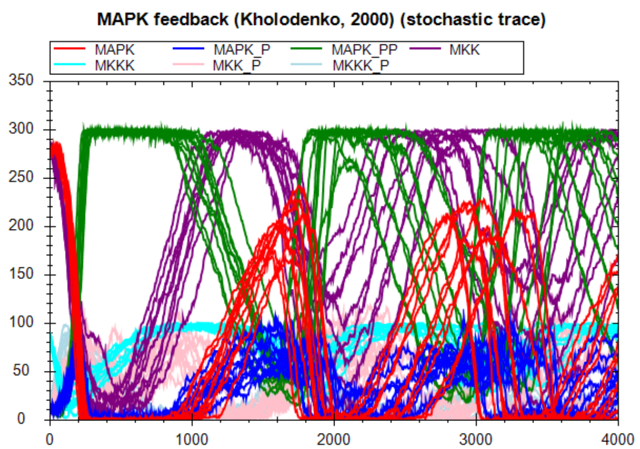
## Parameter Scan



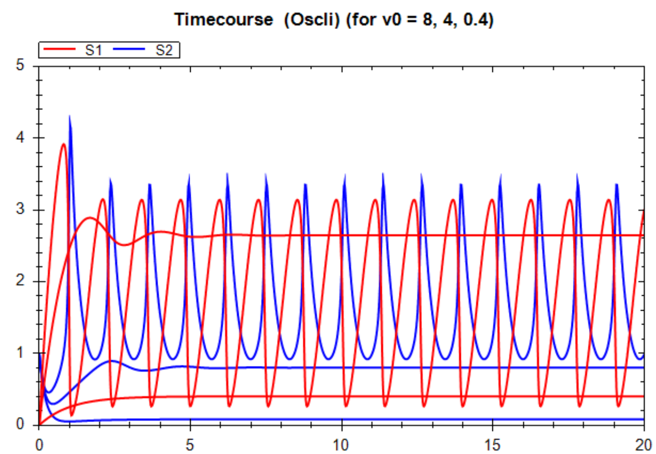

## Pulse Experiments




## Repeated Stochastic Traces




## Time Course Parameter Scan



# SED-ML next version

- Focus on the integration of “data” with SED-ML, e.g.,
  - experimental data for use in model fitting, parameter estimation
  - simulation data for testing implementations
- Adoption of NuML as standard data description format
  - https://code.google.com/p/numl/
  - XML description of underlying data (initially CSV).
  - provides a common data abstraction layer for SED-ML to utilise.