Tool support in NeuroML v1.x

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NeuroML – structure of language
Tools with NeuroML support

Current application support for NeuroML

The following is a list of software applications which currently support NeuroML (last updated: March 2011). Note that not all tools support all parts of NeuroML.

Please contact us if you would like your application included on this list!

In many instances NeuroML import/export in these tools is an add-on to the core functionality of the package, and can sometimes be incomplete or not well documented. If you're interested in this feature in a specific application *let the developers know!* It's only through user feedback that features like this will make it further up long TODO lists.

**NeuroML Validator**

The NeuroML Validator on this website can be used to check the validity of a NeuroML file. The validator allows you to paste the text of the file into the browser window for validation. After validation, the NeuroML Validator allows translation of NeuroML documents into more readable HTML formats or into simulator scripts for use with GENESIS, MOOSE, NEURON and PSICS.

The website also facilitates visualisation of the contents of NeuroML files in 3D using X3D.

**neuroConstruct**

neuroConstruct is a Java based application for constructing 3D networks of biologically realistic neurons. The current version can generate code for the NEURON, GENESIS, PSICS and PyNN platforms and also provides import/export support for MorphML, ChannelML and NetworkML. A detailed description of the current support for NeuroML in neuroConstruct is available [here](#).

Integration with the LEMS interpreter and conversion of NeuroML v1.x based models to v2.0 is in development.

**NEURON**

The NEURON simulation environment is one of the main target platforms for a standard facilitating exchange of neuronal models. Version 6.1 of NEURON can import and export (from ModelView) cells in NeuroML (Level 1 or 2) format. For the latest files for importing/exporting NeuroML in NEURON see [here](#). The NeuroML Validator can also be used to generate NEURON scripts (example) and full NEURON simulations can be generated from NeuroML model components by neuroConstruct.

**GENESIS**

GENESIS is a commonly used neuronal simulation environment and is also a main target platform for the NeuroML specifications. Cell morphologies and channel mechanisms in NeuroML format can be used to generate GENESIS scripts through the NeuroML Validator page here (example). This process can be done with any XML tool for handling XML file transformations, but a short script in a Python-like syntax can also be used.
Core supported simulators in v1.x

<table>
<thead>
<tr>
<th>Feature</th>
<th>NEURON</th>
<th>GENESIS</th>
<th>MOOSE</th>
<th>PSICS</th>
<th>neuroConstruct</th>
<th>PyNN*</th>
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<tbody>
<tr>
<td>Single compartment cells</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Multi compartment cells</td>
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<tr>
<td>Integrate &amp; fire mechanisms</td>
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<td>HH channels</td>
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<tr>
<td>Kinetic scheme channels</td>
<td>X</td>
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<tr>
<td>Voltage &amp; ligand gated channel, e.g. BK, SK</td>
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<td>Gap junctions</td>
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</tbody>
</table>

* Simulator mappings of PyNN which have been tested to date: NEURON, NEST
CX3D

- Cortex3D: tool for simulating the growth of cortex in 3D
- Simulates division and migration of cells, growth of axons/dendrites along chemical gradients
- Developed in lab of Rodney Douglas in Zurich
Whole Brain Catalog

- Graphical interface to numerous databases accessible through the Neuroscience Information Framework (NIF)
- Fits data to standard mouse brain atlas coordinate system, the “Waxholm Space”
- Import & export NeuroML
Whole Brain Catalog: NeuroML support
Neuronland

• Command line tool & GUI to import & export neuronal morphologies in multiple formats:
  • Neurolucida
  • SWC
  • NEURON
  • MorphML
  • & 17 more...
SplitNeuron

- Neural network encoded in a MySQL database
- Multicompartmental cell models
- Izhikevich thalamocortical network like models ($10^6$ neurons with $10^9$ synapses)
NeurAnim

- Developed in the lab of Thomas Nowotny in Sussex
- Can load in NetworkML files & generate movies of network activity
TREES Toolbox

- Developed by Hermann Kuntz in Michael Hausser’s lab at UCL
- (Semi) automatic reconstruction of neuronal morphologies from microscopy image stacks
- Editing, analysis & visualisation of morphologies
- Generation of new synthetic neuronal trees from parameters of existing ones
TrakEM2

- An ImageJ plugin for morphological data mining, three-dimensional modelling and image stitching, registration, editing and annotation
- Developed by Albert Cardona – University of Zurich/ETH
- Latest release exports cells in NeuroML format
Conclusions

- Developers pick & choose what parts of the language to support

- Don’t always let us know until implementation is (almost) finished...

- ... or don’t tell us at all!

- Not a core development priority: often appreciate a helping hand
Add your software!!

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