Tool support in NeuroML v1.x

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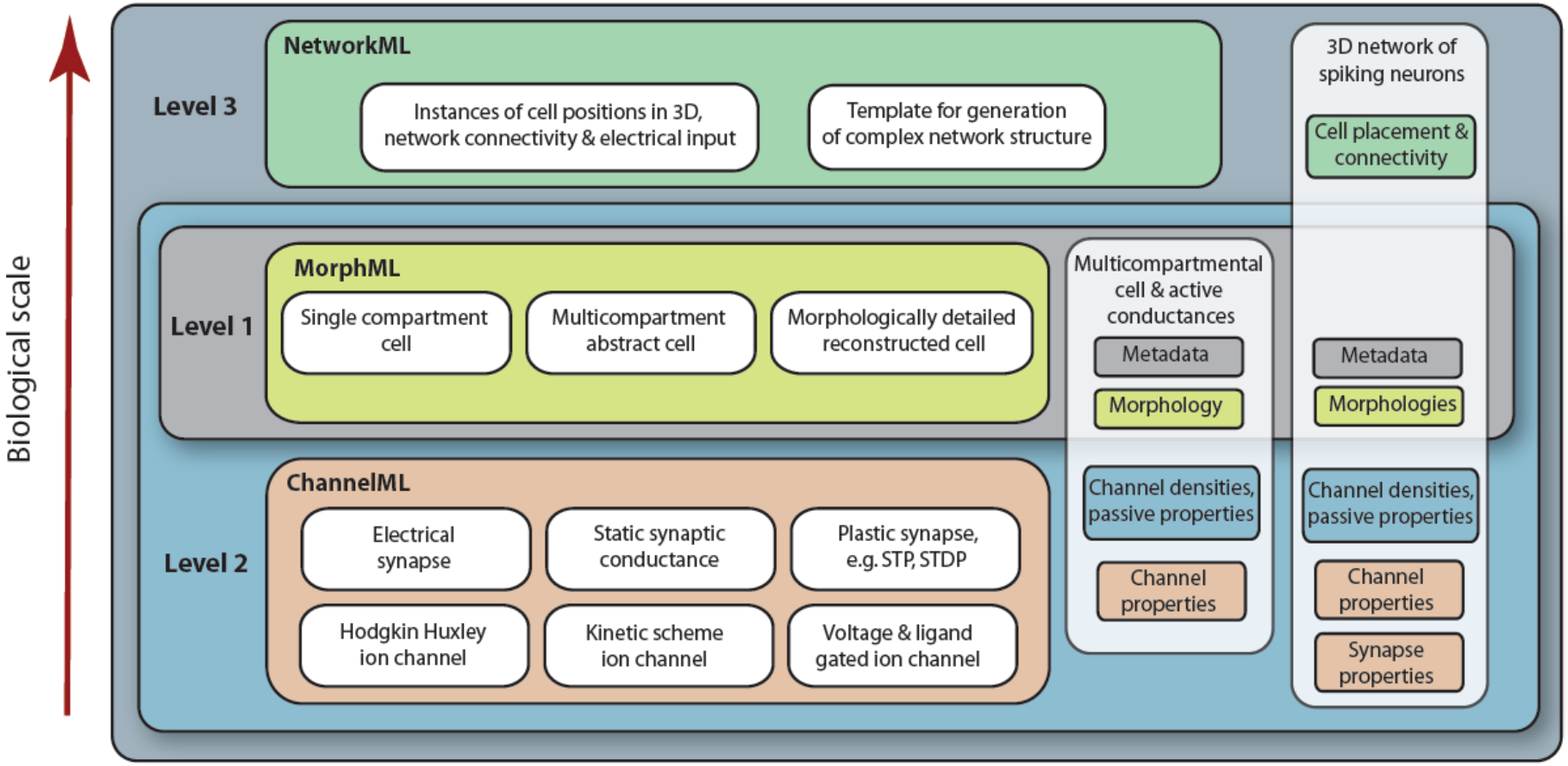
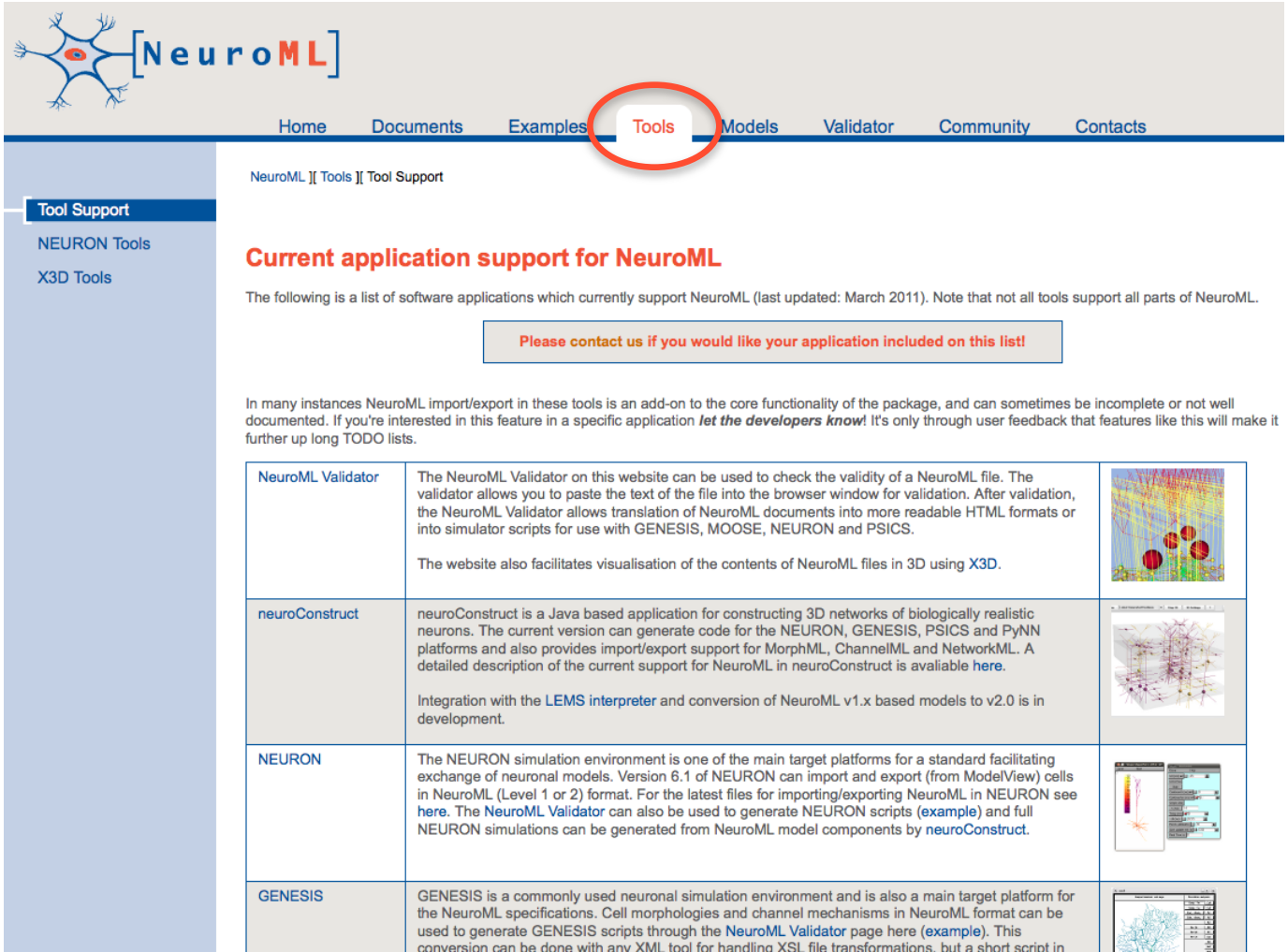
NeuroML – structure of language



Tools with NeuroML support



NeuroML

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NeuroML][Tools][Tool Support

- Tool Support
- NEURON Tools
- X3D Tools

Current application support for NeuroML

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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 avaliable 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	

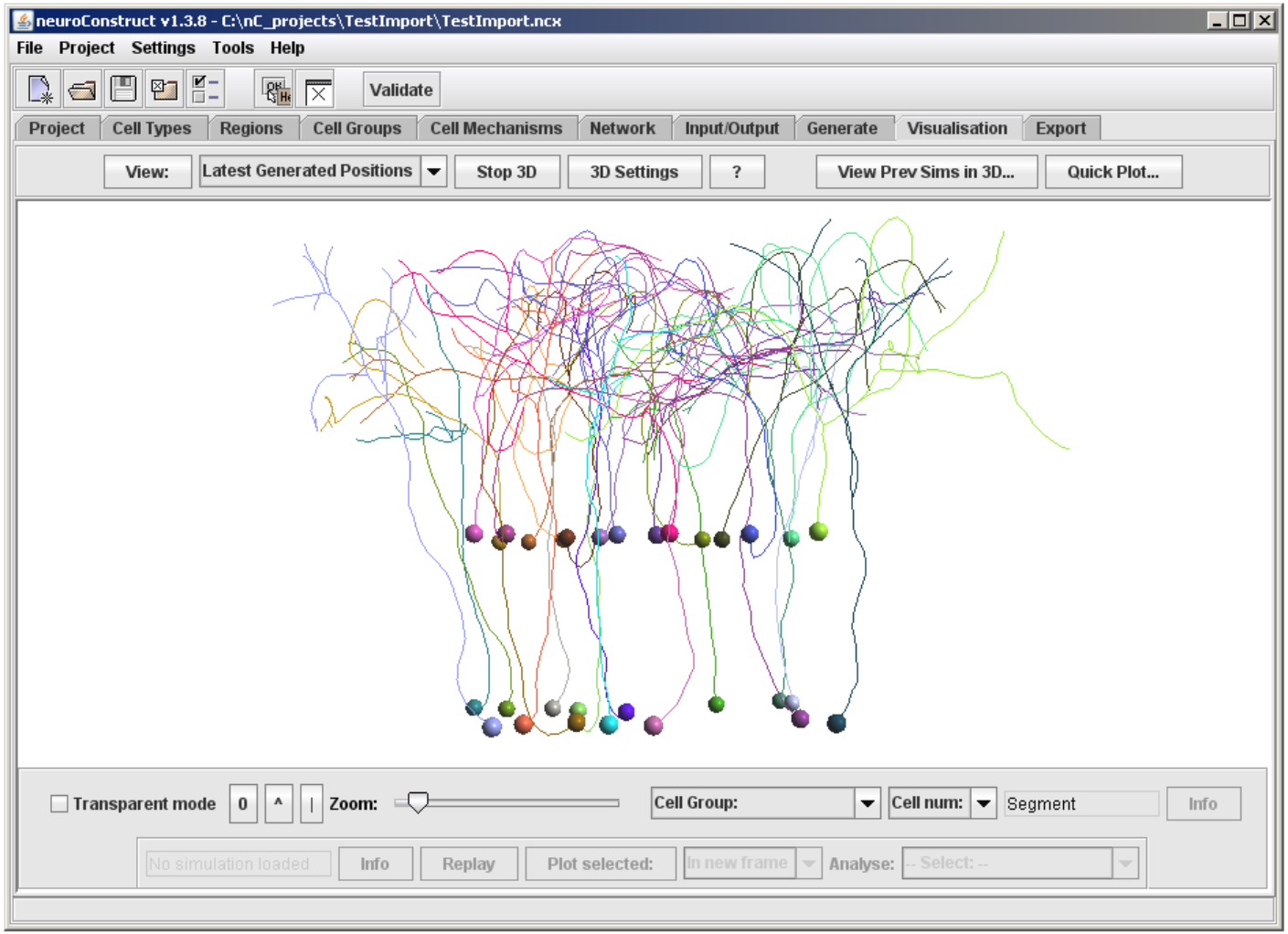
Core supported simulators in v1.x

	NEURON	GENESIS	MOOSE	PSICS	neuroConstruct	PyNN*
Single compartment cells	X	X	X	X	X	X
Multi compartment cells	X	X	X	X	X	
Integrate & fire mechanisms	X				X	X
HH channels	X	X	X	X	X	
Kinetic scheme channels	X			X	X	
Voltage & ligand gated channel, e.g. BK, SK	X	X	X		X	
Networks	X	X	X		X	X
Static synapses	X	X	X		X	X
Plastic synapses	X				X	X
Gap junctions	X	X	X		X	

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

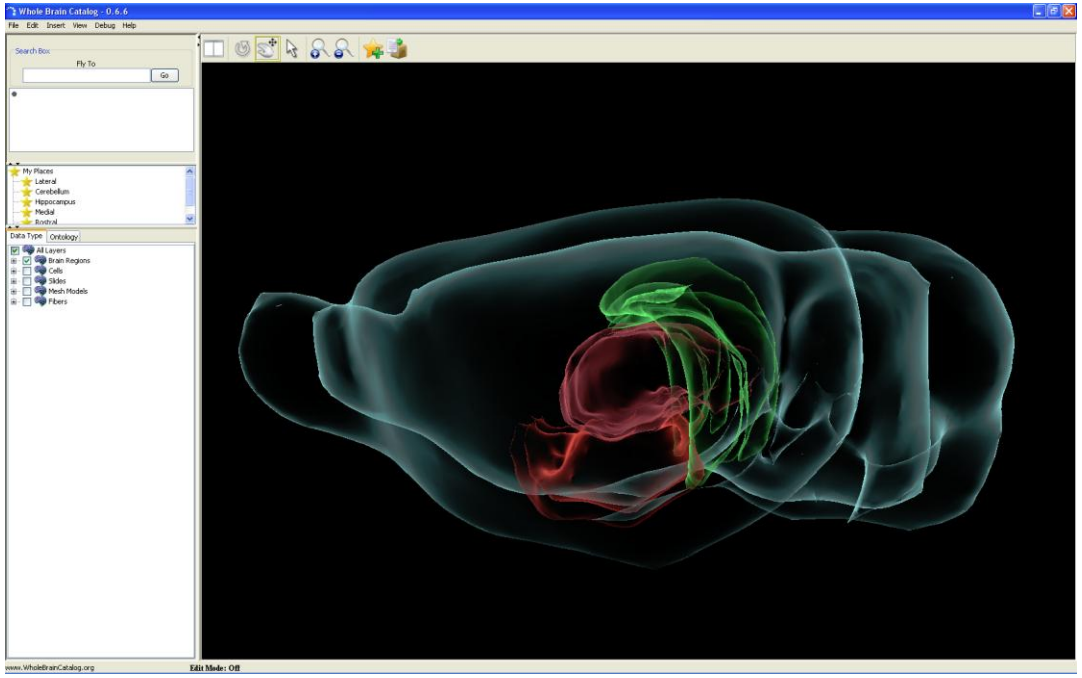
CX3D

- 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


neuroConstruct v1.3.8 - C:\nC_projects\TestImport\TestImport.ncx
File Project Settings Tools Help
Validate
Project Cell Types Regions Cell Groups Cell Mechanisms Network Input/Output Generate Visualisation Export
View: Latest Generated Positions Stop 3D 3D Settings ? View Prev Sims in 3D... Quick Plot...
Transparent mode 0 ^ | Zoom: Cell Group: Cell num: Segment Info
No simulation loaded Info Replay Plot selected: in new frame Analyse: -- Select: --

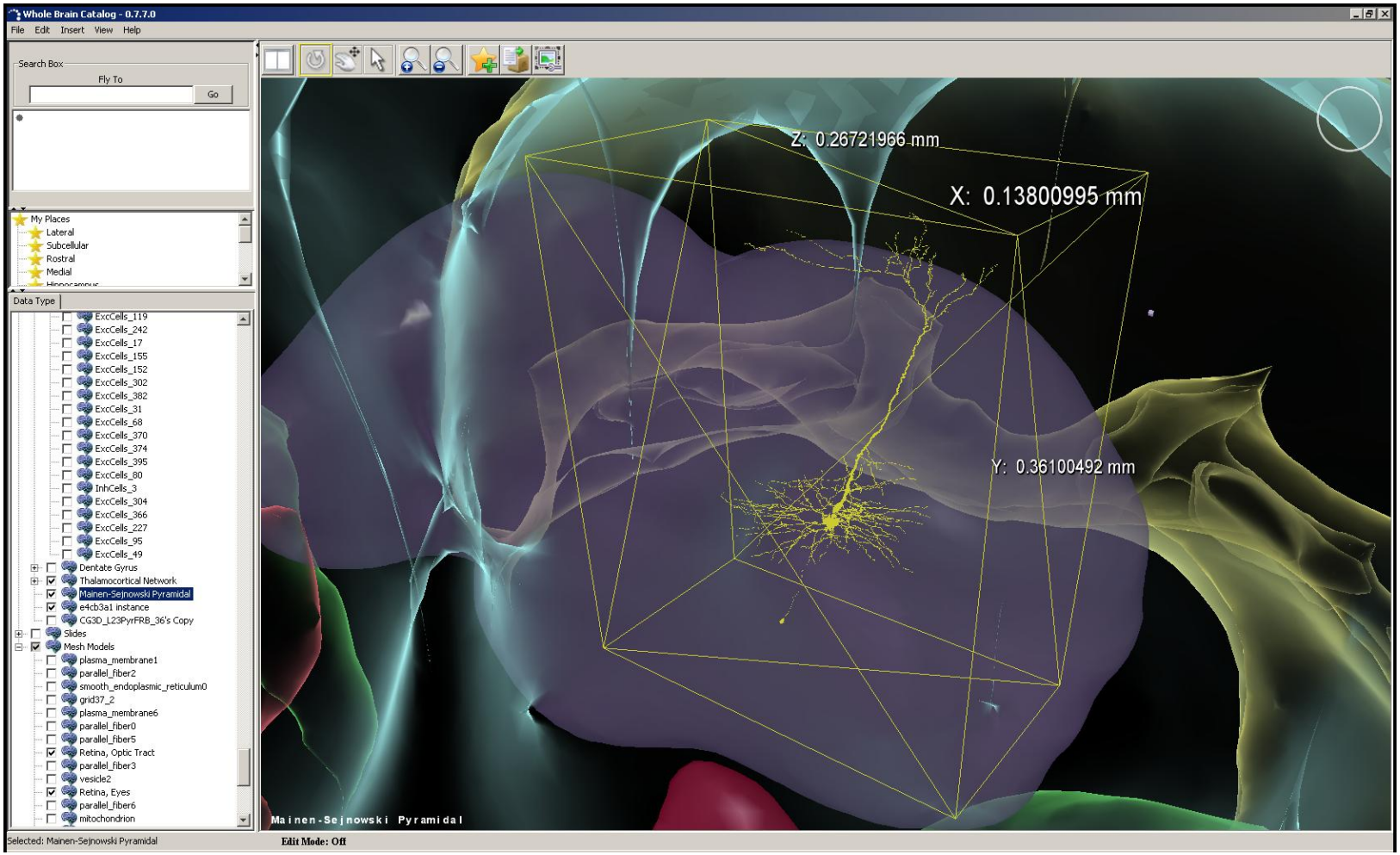
Whole Brain Catalog

- 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



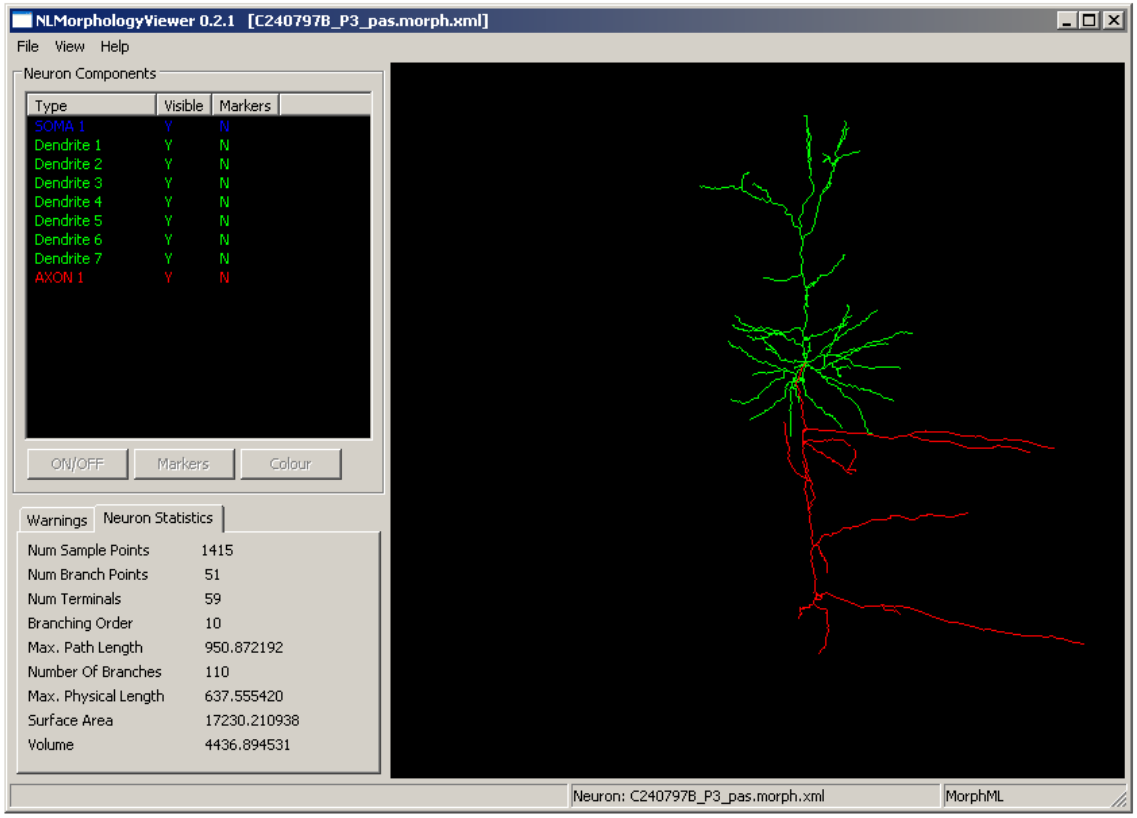
http://wholebraincatalog.org

Whole Brain Catalog: NeuroML support



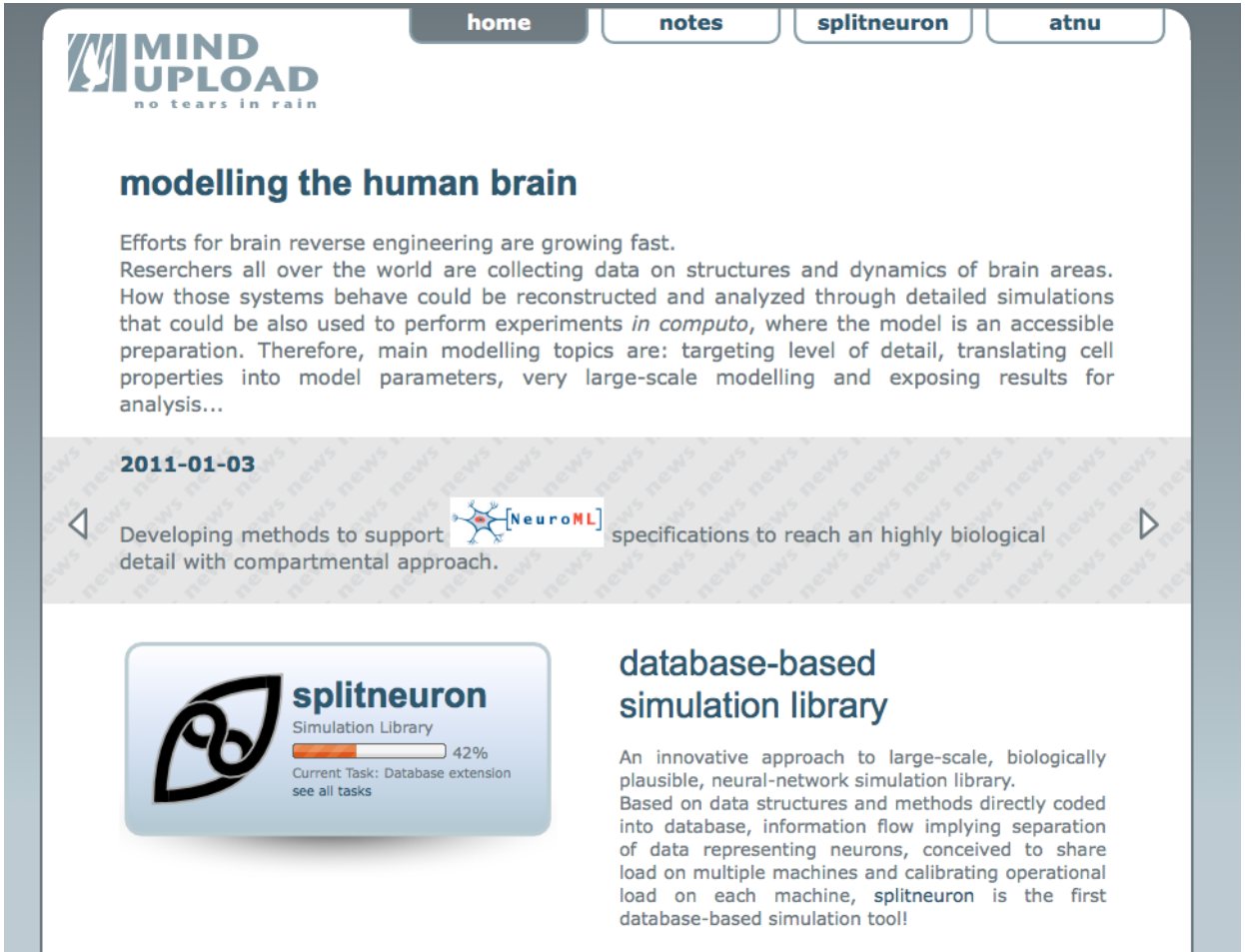
Neuronland

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



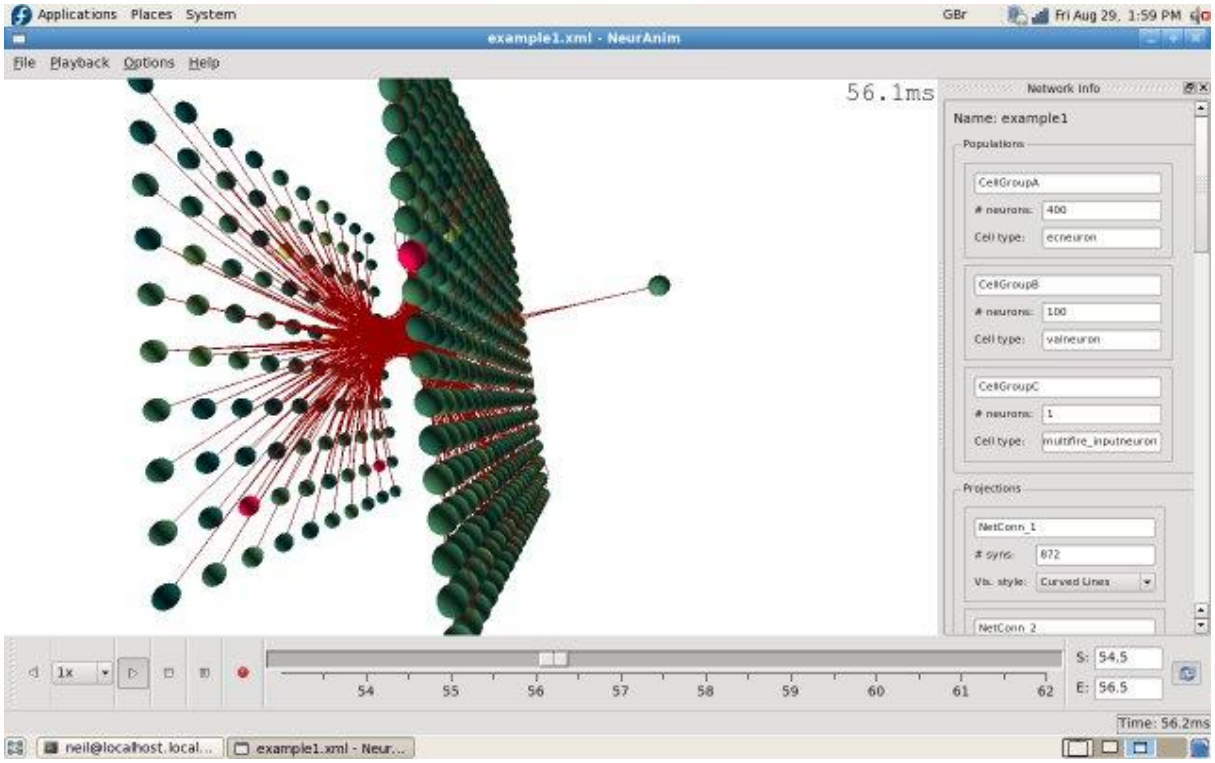
SplitNeuron

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



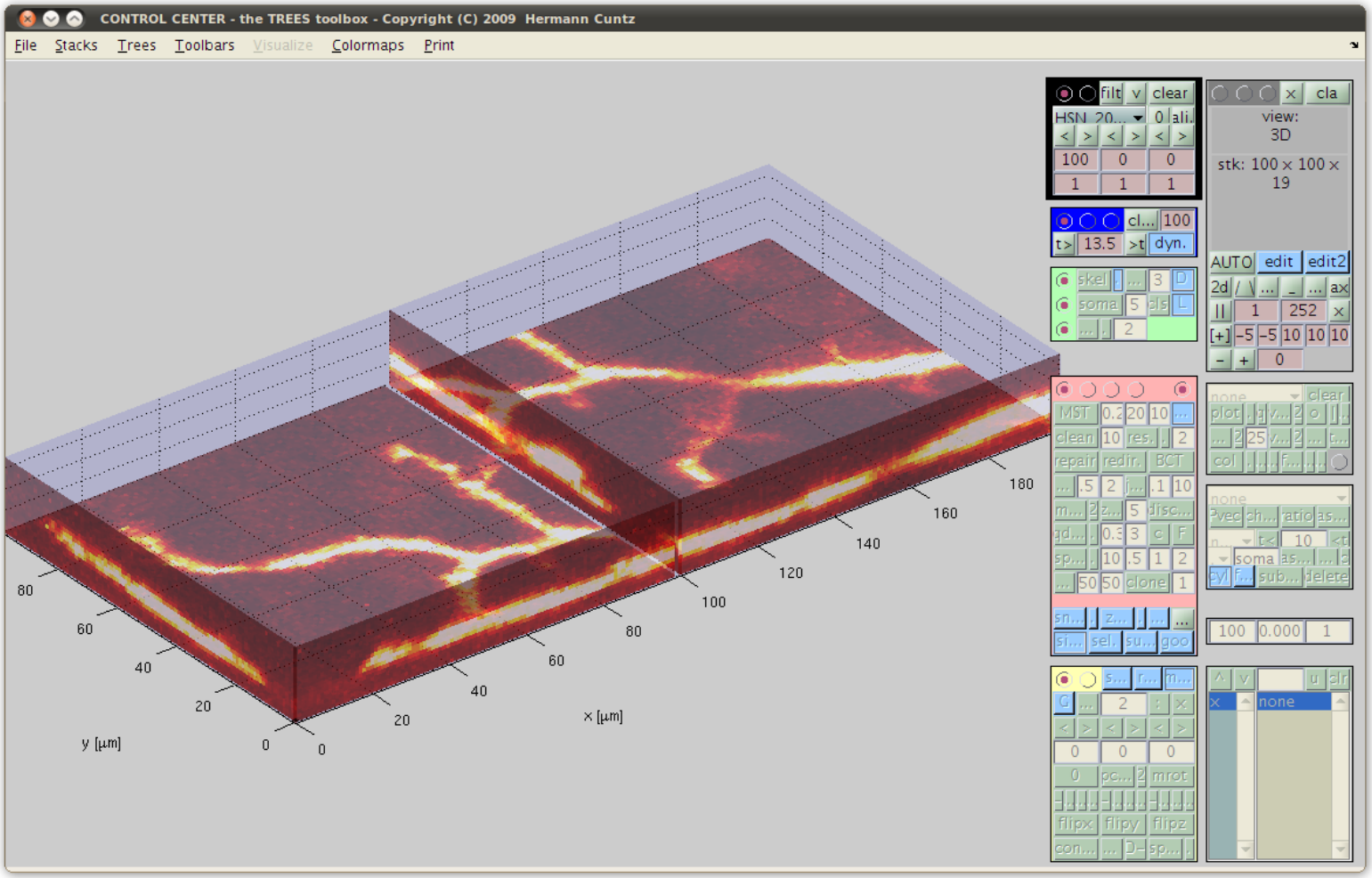
NeurAnim

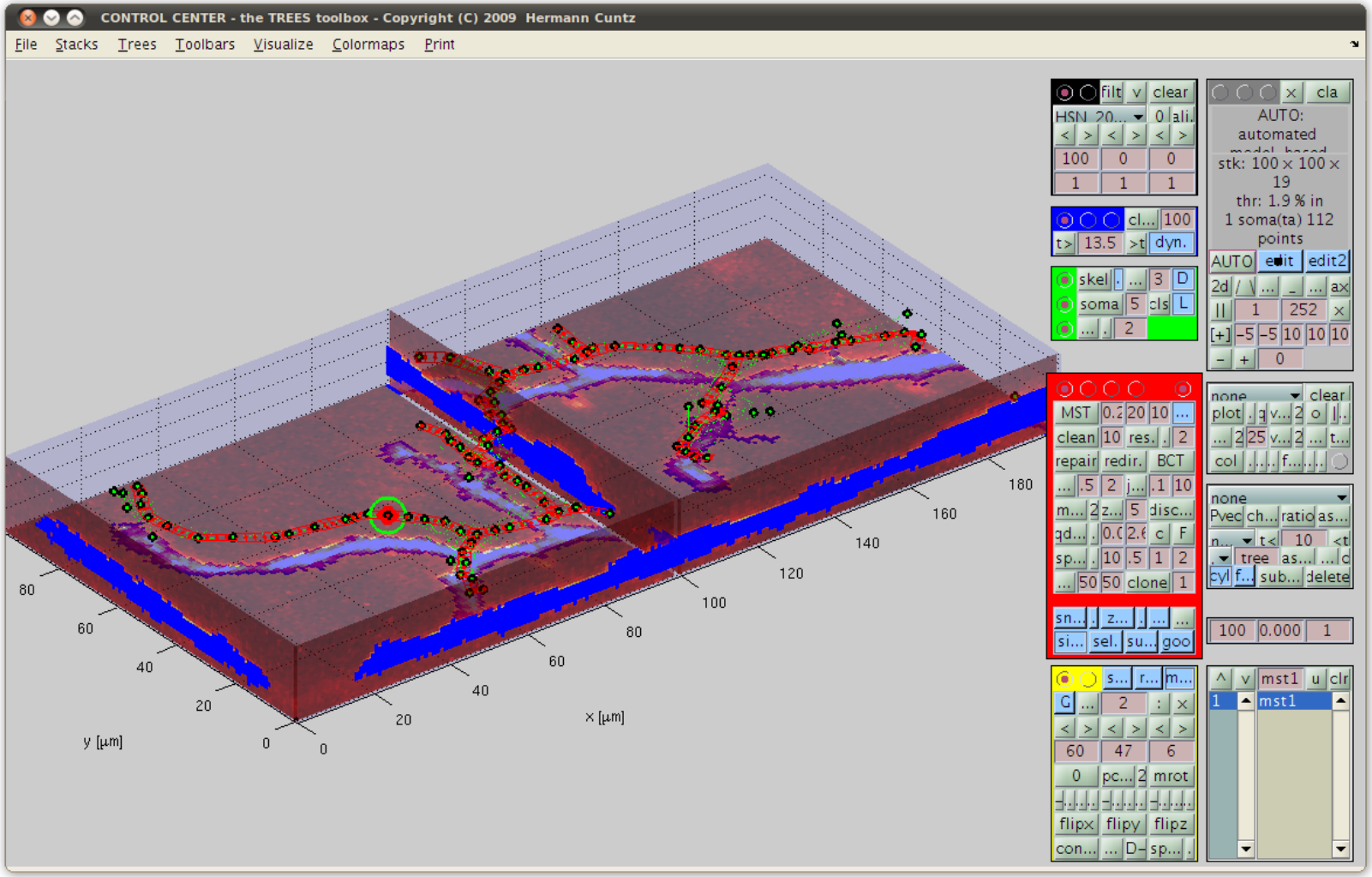
- Developed in the lab of Thomas Nowotny in Sussex
- Can load in NetworkML files & generate movies of network activity

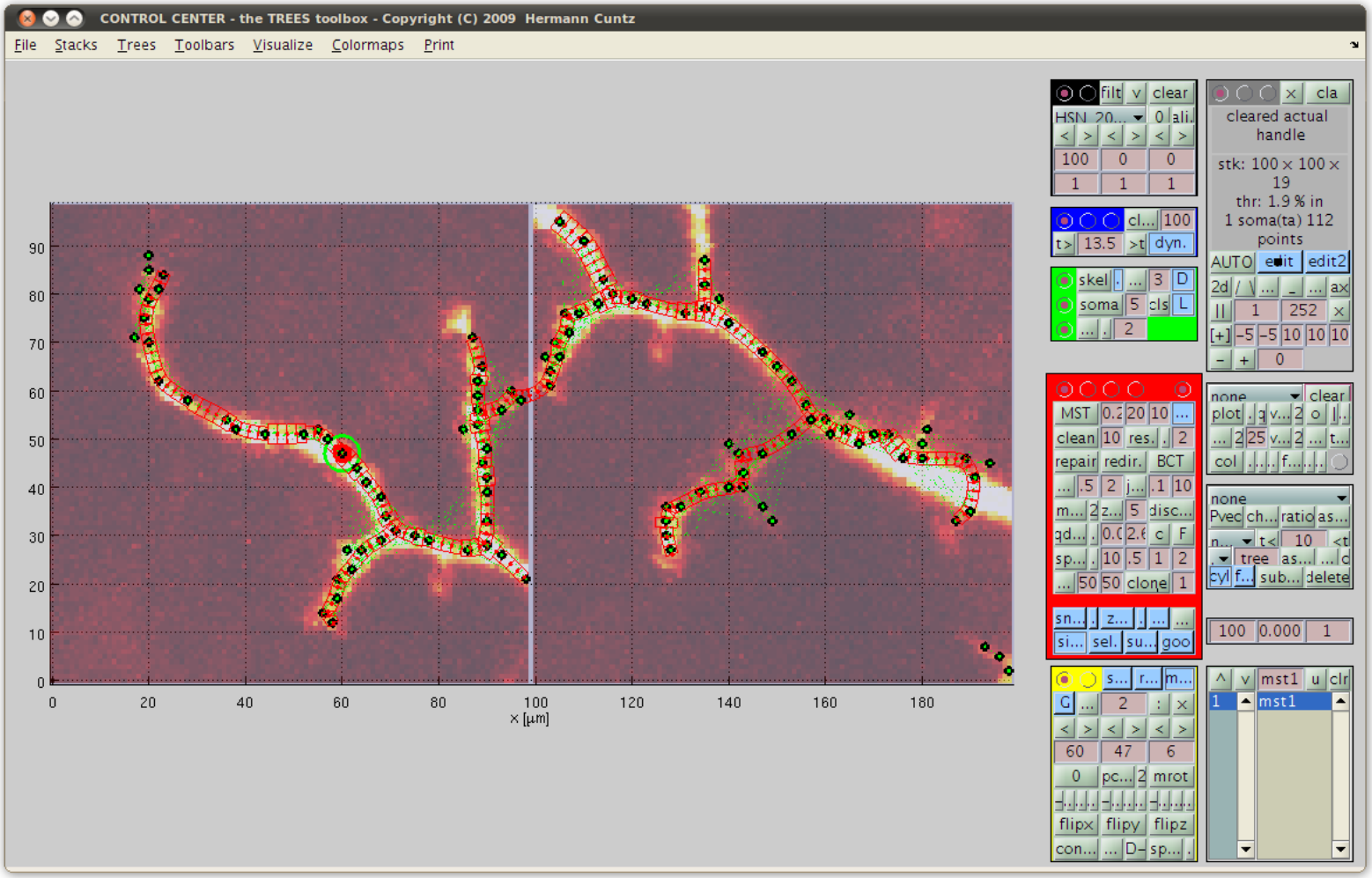


TREES Toolbox

- 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


CONTROL CENTER - the TREES toolbox - Copyright (C) 2009 Hermann Cuntz
File Stacks Trees Toolbars Visualize Colormaps Print
y [µm]
x [µm]
view:
3D
stk: 100 x 100 x 19


CONTROL CENTER - the TREES toolbox - Copyright (C) 2009 Hermann Cuntz
File Stacks Trees Toolbars Visualize Colormaps Print
AUTO: automated
stk: 100 x 100 x 19
thr: 1.9 % in
1 soma(ta) 112 points
y [µm]
x [µm]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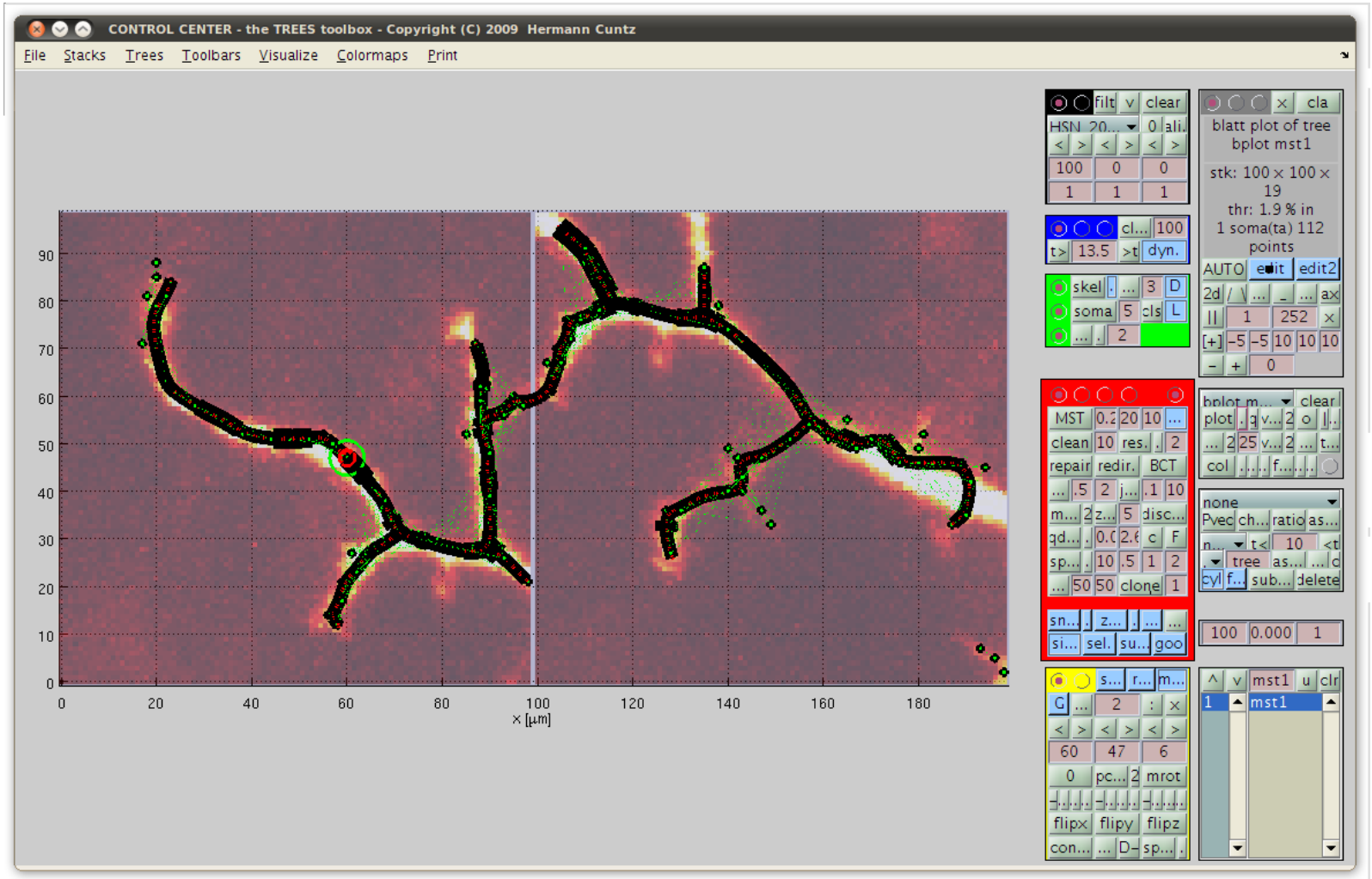
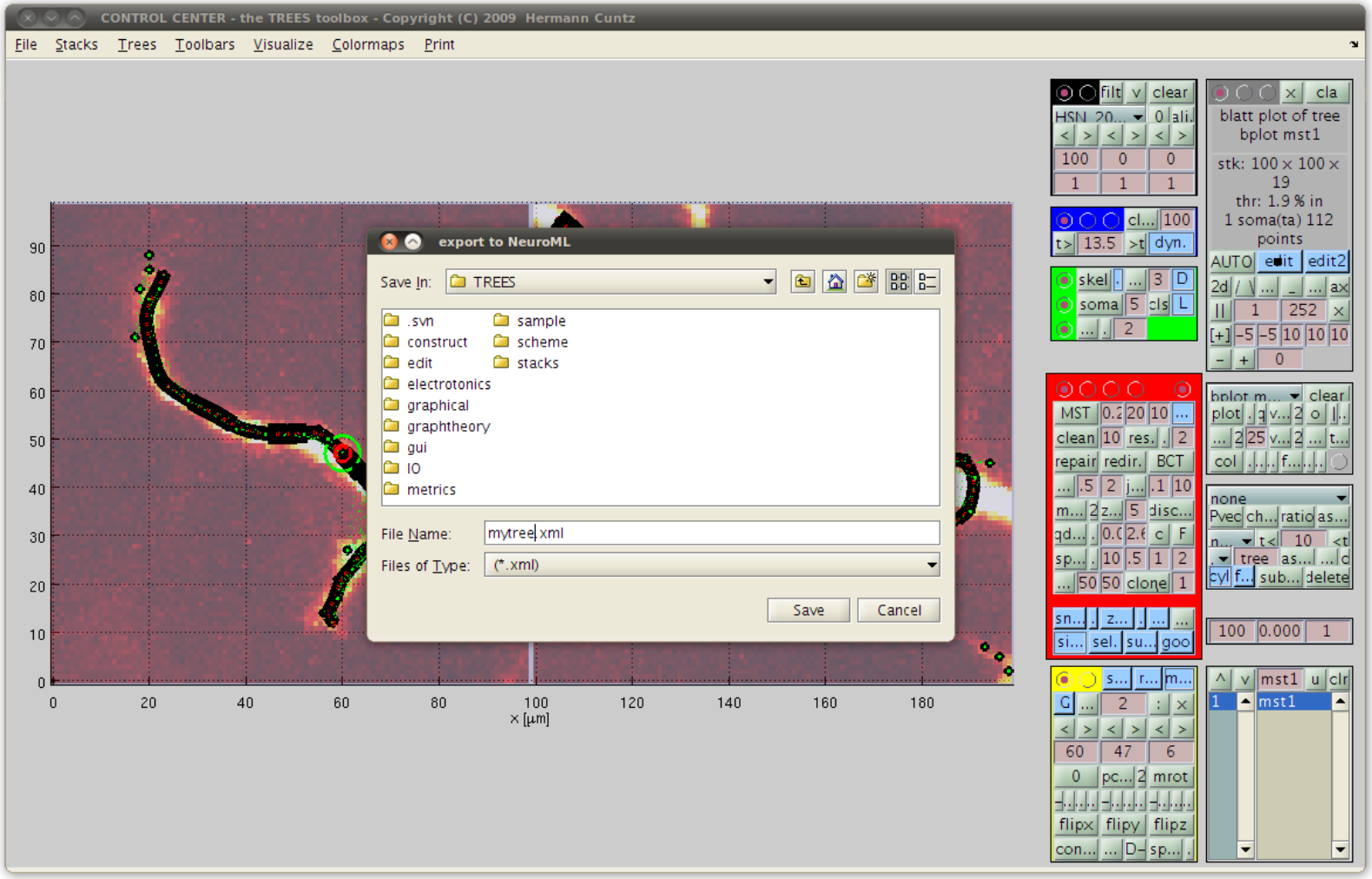
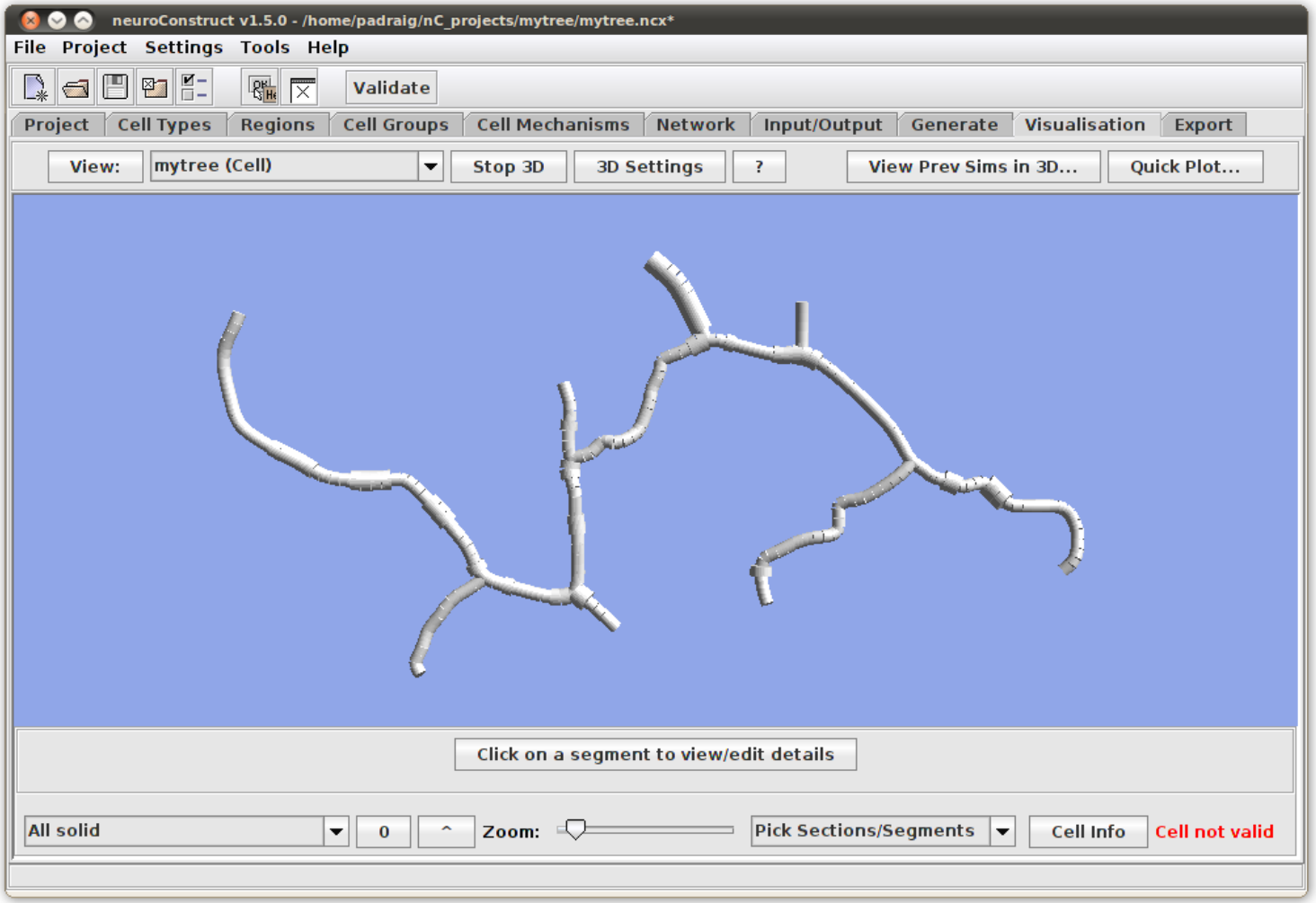
File Stacks Trees Toolbars Visualize Colormaps Print
x [µm]

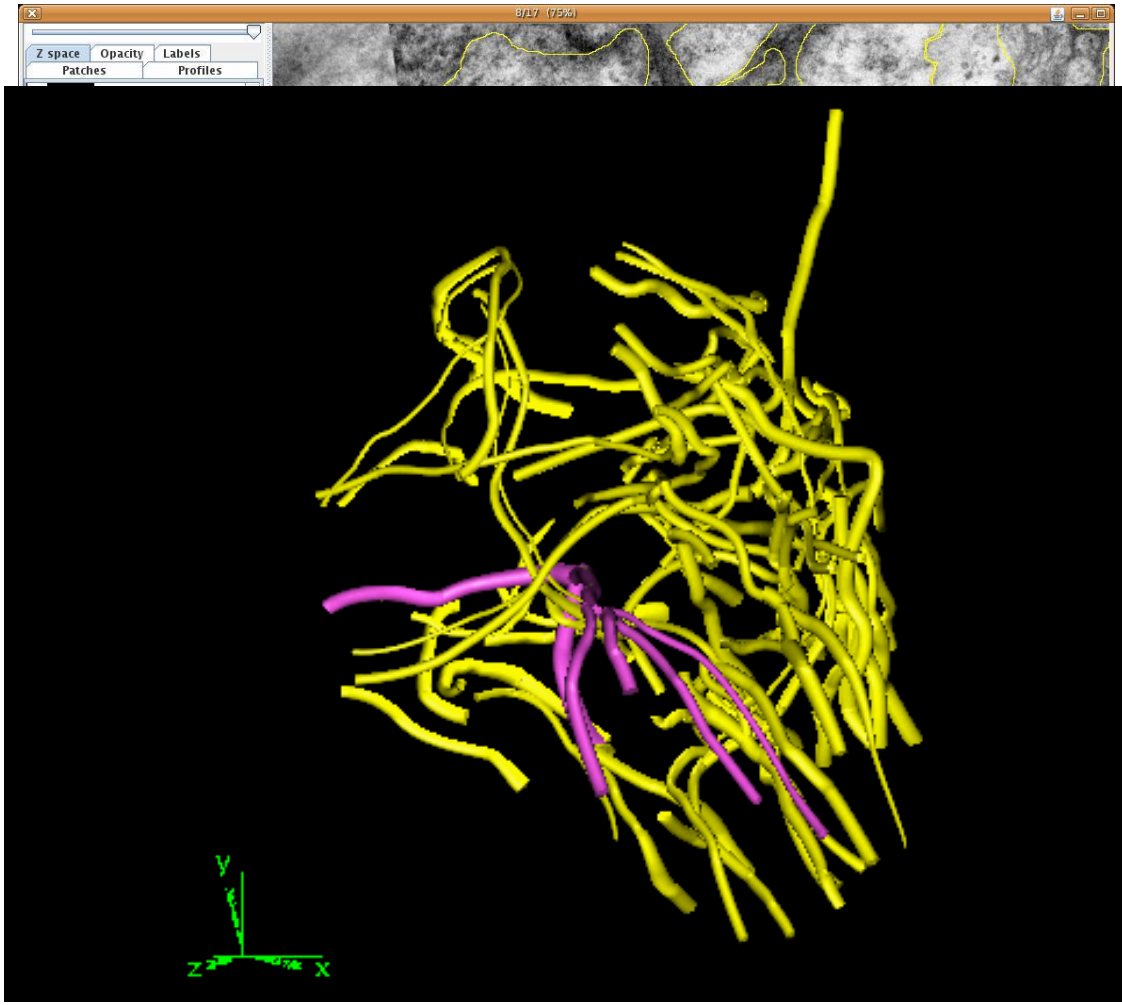

CONTROL CENTER - the TREES toolbox - Copyright (C) 2009 Hermann Cuntz
File Stacks Trees Toolbars Visualize Colormaps Print
blatt plot of tree
bplot mst1
stk: 100 × 100 × 19
thr: 1.9 % in
1 soma(ta) 112 points
0 20 40 60 80 100 120 140 160 180
× [µm]
0 10 20 30 40 50 60 70 80 90


CONTROL CENTER - the TREES toolbox - Copyright (C) 2009 Hermann Cuntz
File Stacks Trees Toolbars Visualize Colormaps Print
export to NeuroML
Save In: TREES
.svn
construct
edit
electrotonics
graphical
graphtheory
gui
IO
metrics
sample
scheme
stacks
File Name: mytree.xml
Files of Type: (*.xml)
Save
Cancel
blatt plot of tree
bplot mst1
stk: 100 × 100 × 19
thr: 1.9 % in
1 soma(ta) 112 points
x [µm]


neuroConstruct v1.5.0 - /home/padraig/nC_projects/mytree/mytree.ncx*
File Project Settings Tools Help
Validate
Project Cell Types Regions Cell Groups Cell Mechanisms Network Input/Output Generate Visualisation Export
View: mytree (Cell)
Stop 3D
3D Settings
?
View Prev Sims in 3D...
Quick Plot...
Click on a segment to view/edit details
All solid
0
Zoom:
Pick Sections/Segments
Cell Info
Cell not valid

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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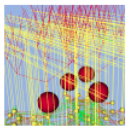
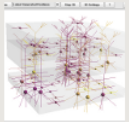
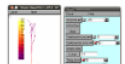
NeuroML Validator	The NeuroML Validator on this website can be used to check the validity of a NeuroML file. The validator allows you to paste the text of the file into the browser window for validation. After validation, the NeuroML Validator allows translation of NeuroML documents into more readable 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 avaliable here. Integration with the LEMS interpreter and conversion of NeuroML v1.x based models to v2.0 is in development.	
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