NeuroML Editorial Board meeting 2019

A meeting of the NeuroML editors took place at the CNS meeting in Barcelona, Monday 15th July, 2019.

Attendees: Robert McDougal (editor), Padraig Gleeson (editor), Salvador Dura Bernal (editor), Matteo Cantarelli, Cengiz Gunay
Absent (approved minutes afterwards): Boris Marin (editor), Andrew Davison (editor)

Minutes of meeting

1) Update on activities

a) NeuroML (& PyNN) are now endorsed standards by INCF

This is an important step to demonstrate NeuroML is an accepted community standard. The INCF process for getting endorsed has various criteria in terms of openness and community engagement. Full details on the relevant INCF page:
https://www.incf.org/resources/incf-endorsed-standards-best-practices

PyNN has also been approved by this process (as has the Brain Imaging Data Structure (BIDS)). Progress continues with interactions between PyNN and NeuroML:
https://github.com/NeuroML/NeuroML2/issues/73

b) NetPyNE interactions

NetPyNE (http://www.netpyne.org) is a major tool supporting NeuroML version 2 (import and export). A paper has recently been published in eLife on the tool:
https://elifesciences.org/articles/44494, and highlights interactions with NeuroML. NetPyNE is one of the major target simulators for NeuroML models visualised through the Open Source Brain website (see below). NetPyNE scripts for loading and simulating the model are generated on OSB's backend server, and either run on the server (Amazon Web Services instance) or can be zipped and submitted to the Neuroscience Gateway (http://www.nsgportal.org) for execution.

c) Automated conversion of NMODL -> NeuroML2

The goal of making it easier to generate/curate/test NeuroML2 channel files from the original channel descriptions in NMODL (NEURON format) files has been around for a while:
https://github.com/NeuroML/NeuroML2/issues/101.

Pramod Kumbhar & Omar Awile have developed https://github.com/BlueBrain/nmodl, a Python library that parses MOD files into ASTs (and writes MOD files from an AST). The underlying parser has been tested with all ModelDB mod files and is expected to be used for

the next generation of nrnivmodl. The AST has been used to successfully compile mod files for use with [CoreNEURON](#), so in principle NeuroML/LEMS export is just another output format. As of 7.7, NEURON now embeds the source code in compiled mechanisms to enable this conversion even in the absence of the original mod file.

Boris Marin has some basic infrastructure for generating [nml from nmodl](#) (based on a parser built from scratch), [which has been tested on (at least) all K channels on the ICG](#). It can be adapted to use the new 'official?' parser described above. There is a lot of work to be done regarding generating 'idiomatic' (declarative) NeuroML instead of the 'imperative' style which stems from compiler like pipelines (mostly involving symbolic computing, which also seems to have been incorporated into Pramod's libraries). In other words, we currently generate new LEMS component types for each mechanism, translating statements in mod to LEMS constructs (IF STMT-> ConditionalDerivedVariable, etc), instead of 'recognizing' higher level constructs such as 'gateHHrates', 'HHSigmodRate').

d) OSB paper & future plans for OSB v2

The Open Source Brain paper has finally been published: Open Source Brain: A Collaborative Resource for Visualizing, Analyzing, Simulating, and Developing Standardized Models of Neurons and Circuits
https://www.cell.com/neuron/fulltext/S0896-6273(19)30444-1

There will be an OSB meeting in Alghero, Sardinia in Sept 2019:
http://www.opensourcebrain.org/docs/Help/Meetings#OSB_2019. This meeting will highlight one of the new directions of the platform, sharing/visualising/analysing of experimental data in standardised form ([Neurodata Without Borders](#)), alongside models in standardised form (NeuroML and PyNN).

e) NeuroML-DB

Sharon Crook and Justas Birgiolas have been updating the NeuroML Database: https://neuroml-db.org/ which has lots of new features for extracting electrical properties of cells and channels.

f) NeuroMLlite - JSON based specifications of networks

Work is continuing on NeuroMLlite, a package designed to make high level declarative specifications of networks easier to build and to use to generate instances of networks (lists of positions and connections) or interact directly with simulators. The current implementation (https://github.com/NeuroML/NeuroMLlite) can be used to generate various graphical representations of the high level networks (graphs, matrices), NeuroML2 files (XML and HDF5), and simulations can be run in jNeuroML, NEURON (directly or via PyNN), NetPyNE, NEST (via PyNN), Brian (via PyNN). A GUI for accessing this functionality is under development.

g) Rate based/neural mass models in NeuroML2/LEMS

Work on expanding NeuroML and LEMS to allow rate based/neural mass models to be specified and run started during a Google Summer of Code in 2017 with Jessica Dafflon. A number of models have been converted in this process, including the classic Wilson and Cowan network (https://github.com/OpenSourceBrain/WilsonCowan), a network from del Molino et al. (2017). Paradoxical response reversal of top-down modulation in cortical circuits with three interneuron types. Elife, 6, e29742 (https://github.com/OpenSourceBrain/del-Molino2017) and a large scale laminar cortex model from Mejias et al., Feedforward and Feedback Frequency-Dependent Interactions in a Large-Scale Laminar Network of the Primate Cortex. Science Advances, 2016 (https://github.com/OpenSourceBrain/MejiasEtAl2016).

h) SONATA interactions

We have been collaborating with the Allen Institute and Blue Brain Project to add support for the SONATA data format (https://github.com/AllenInstitute/sonata) to NeuroML tools. This allows efficient specification of network structures and simulation results in a format based on JSON, CSV and HDF5. NeuroMLlite is the main package where SONATA import and export is being developed, and PyNN and NetPyNE are also developing support for the format. This work is described in a recent manuscript on biorXiv: https://www.biorxiv.org/content/10.1101/625491v1

2) New releases of NeuroML core specification and libraries

A new release (beta5) for the NeuroML Schema and associated tools is long overdue. This effectively consists of merging the latest development branches for the core NeuroML repositories (https://github.com/NeuroML) to the master branches. The full NeuroML development/release process is described here: https://docs.google.com/document/d/1Z9PNayuBzg8AMUDUN1QXCZjlrEUnaMDDriDk0FoyMLI/edit#

All of the libraries have been well tested as part of the finalisation of the OSB paper and it was agreed that this is as good a time as any to move to a "full" NeuroML v2 release and make the next version 2.1. This will be shortly after beta5 is released and tested.

3) Update of core documentation/website

An overhaul/update of the website content is also overdue. It should focus more on "**How is NeuroML useful for me and how do I use it**?". There is plenty of content about, but it just needs to be organised. There is some work in progress on: The NeuroML Guide: https://docs.google.com/document/d/1TWC5uL1Kckasbz9RMfh_VXubO8jY33KY7Y8AKNoJk9M/edit

4) INCF Special Interest Group on Network Specifications

A Special Interest Group on Standardised Representations of Network Structures has been set up with a number of members with an interest in developing and sharing networks, including developers from NeuroML, PyNN, Sonata, BMTK, NetPyNE, The Virtual Brain, NEST and NineML https://github.com/NeuralEnsemble/Networks_SIG. This initiative has a wider scope than just developing/promoting NeuroML, and recognises that for various reasons different formats and approaches will coexist and need to interact well.

Activities of this have been informal so far, but already many of the participants have contributed to the OSB, NetPyNE and Sonata publications. Further activities and future planning for this SIG will take place at the Sardinia OSB meeting in September 2019.