Recent advances in ModelDB

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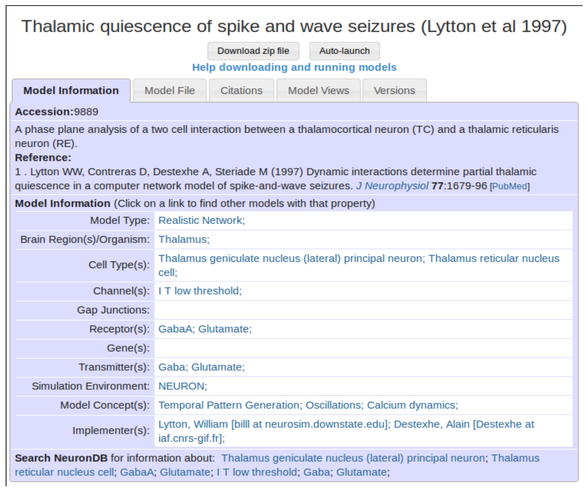
Introduction

Experiment-based models of neurons and neuronal circuits have grown increasingly complex since the early computational neuroscience work of Hodgkin and Huxley and Rall. Complexity potentially improves realism, but at the cost of reproducibility. ModelDB, founded in 1996, addresses this difficulty and enhances the scientific utility of computational neuroscience models by providing a convenient venue to share and discover model computer code associated with peer-reviewed publications. ModelDB now contains approximately 1100 published models covering more than 130 research topics built using a wide variety of simulation software. It is actively curated and developed to help users locate and understand models of interest. For example, every model entry is tagged with searchable metadata about the biological system and phenomena that it addresses.

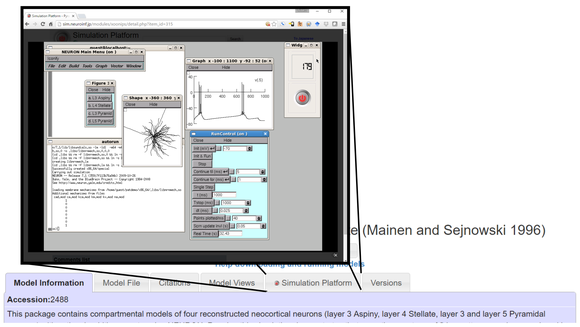
ModelDB example model entry



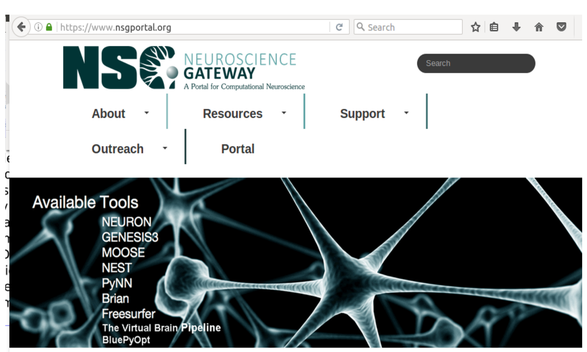
New "tabbed" showmodel page is illustrated in above example ModelDB entry #9889. Note displayed metadata keywords such as "Realistic Network" and "Thalamus". These curated keywords are entered by the modeler or database administrator and are time consuming to assign at the time of model submission. To ease the process **ModelDB now provides an abstract keyword detection tool** (see adjacent poster "755.13 Automated metadata identification for better model discovery").

Running models

ModelDB also provides mechanisms to assist running models both locally and remotely. If NEURON is installed and an internet browser is configured to use it as an application, then many of the NEURON models can be automatically started on the client computer by clicking the auto-launch button (see example ModelDB entry previous panel). A recent extension to this method provides the ability to auto-launch python versions of NEURON scripts.
ModelDB's long time collaboration with SimPF (the INCF Japan Node) maintains a remote platform where hundreds of ModelDB models can be launched immediately.

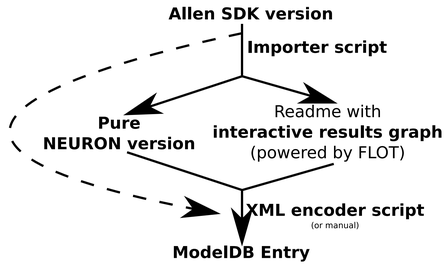


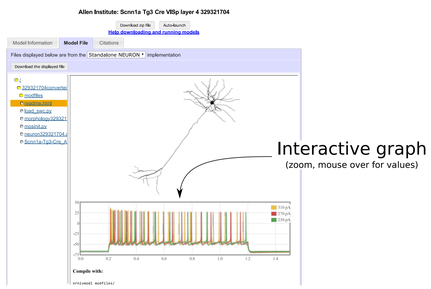
The SimPF group has preinstalled NEURON and GENESIS so the only software required for the modeler is an internet browser.
An additional method to launch models on the Neuroscience Gateway (NSG), a freely available supercomputer portal for computational neuroscience, is under development.



Institutional Model Import Methods

Semi-automated pipelines now facilitate importing large numbers of models from a research group. e.g. for the Allen Institute:



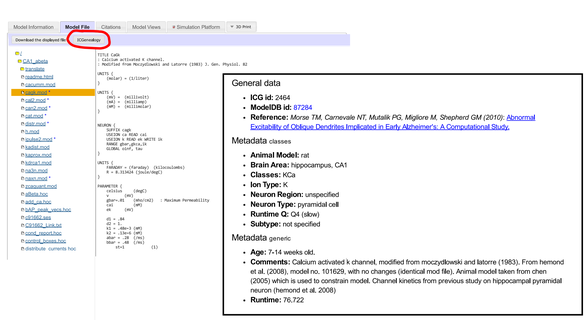


Import pipelines **reduce curation time**, **improve quality**, and **promote the use of advanced visualization features** since the per model time cost is low.

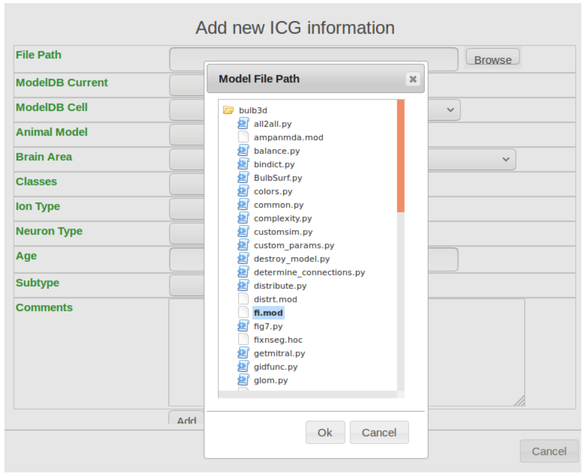
We are developing strategies to ensure that related models from large groups are individually discoverable without impairing the discovery of the contributions of others.

Ion Channel Genealogy

We are collaborating with the Ion Channel Genealogy (icg.neurotheory.ox.ac.uk). An ICGenealogy button provides **rapid access from channel code to channel metadata**, if available on the ICGenealogy site.



New data entry forms enable modelers to contribute ion channel genealogy information as they contribute models:



The first three of these fields (File Path, ModelDB Current, and ModelDB Cell) are populated by ModelDB data; the remainder are selected from ICGenealogy's metadata fields. After the model is made public, the ion channel data is sent to ICGenealogy for further curation. The ICGenealogy team performs analysis on the channel to find current clamp traces, etc. We plan to use the ion channel type information to allow searching for ion channel models instead of just models containing a given channel type.

Conclusions

Each of ModelDB's capabilities, from the model entry submitting and editing forms that the modeling community uses, to the search engines used to find models, the display of model information (showmodel page), the metadata itself such as new ion channel genealogy structures, as well as the topic keywords used to further describe the models, is undergoing additions, continued refinement and improvement.

Keep up-to-date

@SenseLabProject http://modeldb.yale.edu

Acknowledgements

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