INTRODUCTION TO ARBOR

Arbor and Arbor GUI demonstration

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arbor

JÜLICH Forschungszentrum

WHAT IS ARBOR?

Arbor is a library for implementing performance portable-network simulations of multi-compartment neuron models.

- Simulate large networks of morphologically-detailed, spiking neurons
- Modern code, made for HPC from the start
- Open development style on Github and Gitter
- Friendly interface and documentation
- Separate neuroscience from execution
  - Define science once, then run locally or HPC, share, etc
  - No leaky abstractions, e.g. discretisation
  - Declarative domain specific languages for modelling

ARBOR STATUS

- Latest release: v0.5.2
- 42 Github forks
- 1300+ commits to main branch
- loc: C++ header: 68k, C++: 68k, Python: 16k, reStructuredText: 8k
- 24 contributors, from 9+ institutions

Ongoing collaborations:

- FIPPA - extend Arbor by key plasticity processes to simulate and analyze the long-term adaptive dynamics of large-scale, morphologically-detailed neuronal networks
- Arborio - large-scale model of the inferior olive of the cerebellar complex as a case study
- LFPy - investigating Arbor as possible backend
- Co-simulation - Nest, Elephant, TVB

WHAT'S NEW IN 0.5.2?

- Features
  - Simplified connections and junctions.
  - Enable simulation resume/restart.
  - Add post events functionality to support models with STDP synapses
  - Labels instead of indices for placeable item identification.
- Expanded set of tutorials
- CI significantly expanded
  - Automated building of Python and Spack packages
  - Soon: Ebrains CD
- File format compatibility: cell morphologies
  - SWC
  - NeuroML
  - Neurolucida ASCII
  - Arbor Cable Cell

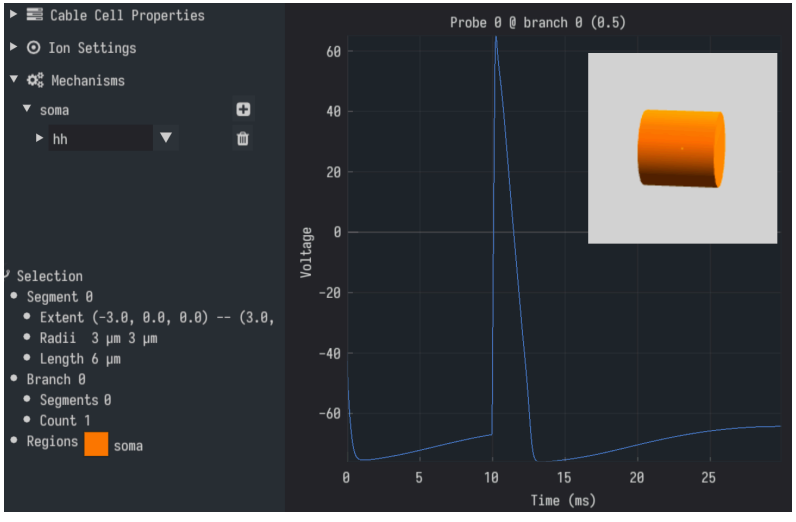
WHAT'S NEW SINCE 0.5.2?

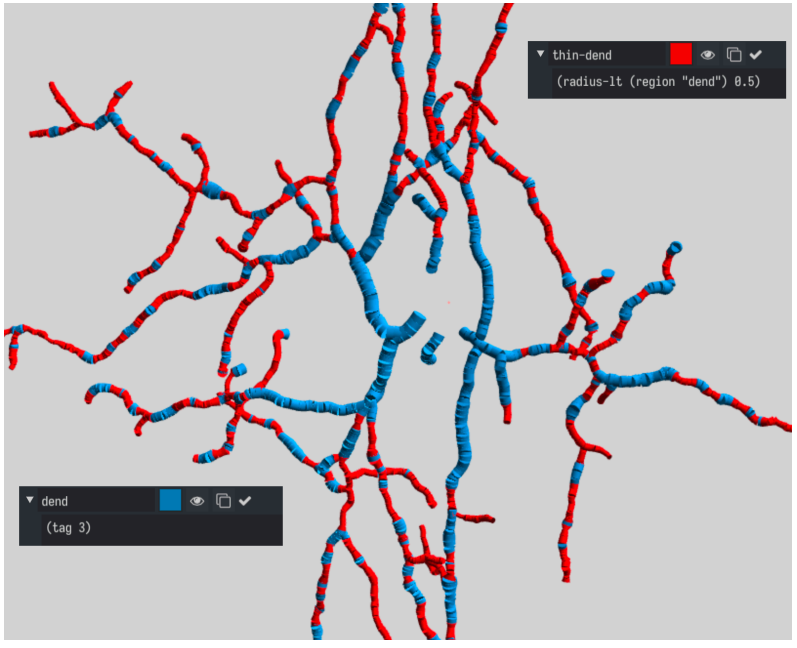
- Features
  - Mechanism ABI
  - User-defined gap-junction mechanisms
- Bug-fix
  - Zero-radius segments in a morphology
- Ongoing development
  - Python performance profiler
  - S-expression representation of CV-policies
- Next release
  - v0.6 planned for 19 Jan 2022
  - Regular Developer meetings
    - Next: 24 November 2021, 10:00-13:00 CEST.
    - `arbor-sim.org/news`
- and...

ARBOR-GUI

Interactive Design of Cell Models

- Morphologically-detailed models have many moving parts
  - Importing morphologies
  - Assigning dynamics and parameters
  - Placing stimuli and probes





- Arbor-GUI delivers interactive, visual feedback
  - Peek into ’Arbor’s brain’
  - Live edit DSL expressions
  - Run short simulations

THE END

Questions?

- Web: `arbor-sim.org`
- Docs: `docs.arbor-sim.org`
- Contact: `contact@arbor-sim.org`
- Community: `github.com/arbor-sim/arbor/discussions`
- Chat: `gitter.im/arbor-sim/community`

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