PyNEST NG: A new modern interface to the NEST kernel

Wednesday 18 June 2025 11:30 (20 minutes)

SLI, the Simulation Language Interpreter, has been a defining feature of NEST since its beginning and its primary user interface [1]. Since the introduction of PyNEST with the first public beta of NEST 2.0 in 2008 [2], users have increasingly switched from SLI to PyNEST, to a point where today only few users and developers are fluent in SLI or familiar with the interpreters C++-implementation. We thus decided several years ago to remove the SLI interpreter from the NEST simulator and connect PyNEST directly with a NEST C++ API.

A key challenge to removing the SLI interpreter from NEST was the DictionaryDatum data structure provided by SLI. It is central to data exchange between user and simulator and thus pervades much of NEST kernel and model code. As early as 2018, Jochen Eppler and Håkon Mørk began work on a "SLI-free" NEST, including a replacement for the SLI dictionary data structure. Nicolai Haug and Hans Ekkehard Plesser contributed at later stages. One of the last stumbling blocks to be resolved was an efficient approach to dictionary access checks, which is crucial to detect misspelled parameter names.

The other major challenge in removing the SLI interpreter was to port the hundreds of tests for NEST written in SLI to PyTest. This was undertaken as a broad community effort during several hackathons and is not yet entirely completed. This work is done in the NEST master branch to immediately make the ported tests available.

At present, PyNEST NG is essentially complete, with benchmark tests on various complex models indicating good, for some models notably reduced, model construction times. Once the remaining test will have been ported from SLI to PyTest, PyNEST NG will be ready for integration into NEST. This will only minimally affect the user interface.
In my talk, I will give an overview over the implementation of NESTs new Python interface, benefits for users and developers, and discuss challenges ahead.

Acknowledgements

References

[1] Diesmann, M., Gewaltig, M.-O., & Aertsen, A. (1995). SYNOD: An Environment for Neural Systems Simulation—Language Interface and Tutorial (Technical Report GC-AA-/95-3; p. 72). Weizman Institute of Science.
[2] Eppler, J. M., Helias, M., Muller, E., Diesmann, M., & Gewaltig, M.-O. (2008). PyNEST: A convenient interface to the NEST simulator. Front Neuroinformatics, 2, 12. https://doi.org/10.3389/neuro.11.012.2008

Keywords

Preferred form of presentation

Talk (& optional poster)

Topic area

Simulator technology and performance

Speaker time zone

UTC+2

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Acknowledgements

References

[1] Diesmann, M., Gewaltig, M.-O., & Aertsen, A. (1995). SYNOD: An Environment for Neural Systems Simulation—Language Interface and Tutorial (Technical Report GC-AA-/95-3; p. 72). Weizman Institute of Science.
[2] Eppler, J. M., Helias, M., Muller, E., Diesmann, M., & Gewaltig, M.-O. (2008). PyNEST: A convenient interface to the NEST simulator. Front Neuroinformatics, 2, 12. https://doi.org/10.3389/neuro.11.012.2008

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Session Classification: Talks