NEST simulator

Presentation · December 2018

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26 PUBLICATIONS   **30** CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Project   Computational Models of the Retina View project

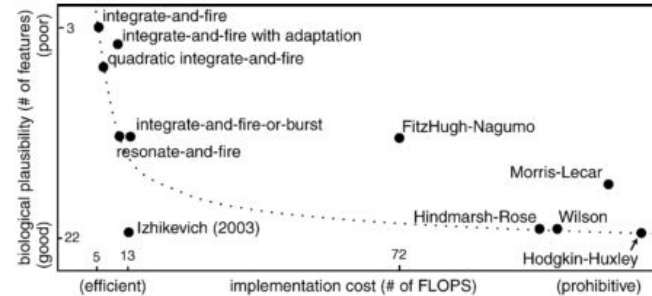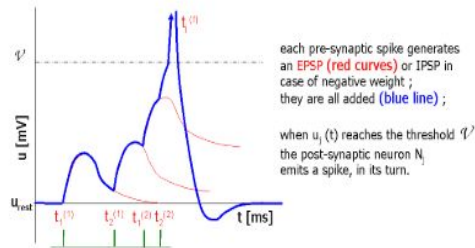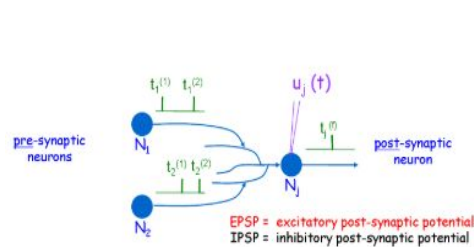Project   Si elegans View project

NEST simulator

Pedro Machado

Overview

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- Introduction
- Spiking Neuron Models
- Spiking Neuron Simulators
- Why NEST?
- Pros and Cons
- NEST in the Human Brain Project
- Where to start?
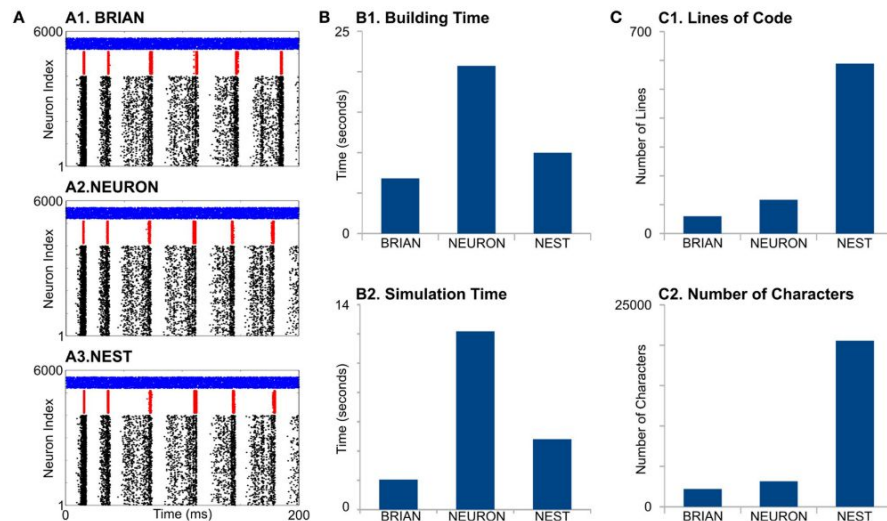- Simple application
- Discussion

Spiking Neuron Models

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Eugene M. Izhikevich, 2004)

[1] H. Paugam-Moisy, "Spiking Neuron Networks A survey," Idiapch, vol. 592, pp. 1–44, 2006.

Spiking Neuron Simulators

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There are 4 main Spiking Neuron Simulators:

- Brian
- Neuron
- Genesis
- NEST

[1] R. A. Tikidji-Hamburyan, V. Narayana, Z. Bozkus, and T. A. El-Ghazawi, "Software for Brain Network Simulations: A Comparative Study," Front. Neuroinform., vol. 11, no. July, pp. 1–16, Jul. 2017.

Why NEST?

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"NEST is a simulator for spiking neural network models that focuses on the dynamics, size and structure of neural systems rather than on the exact morphology of individual neurons. The development of NEST is coordinated by the NEST Initiative."

NEST is available in the following languages:

- Python (PyNEST)
- C/C++

http://www.nest-simulator.org/

Pros and Cons

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Pros

- Highly parallel. The user can define the number of threads.
- Distributed Computing. It is possible to run the same simulation in multiple machines (MPI)
- The user has an high level of control
- Very well supported and the NEST community is very active.

Cons

- Complex networks require several GB of DDR.
- NEST is widely declarative (i.e. several lines of code are required to describe a simulation)

NEST in the Human Brain Project

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"Use the Neurorobotics Platform (NRP) developed in the Human Brain Project (HBP) to connect spiking neural networks to virtual and real robots. This enables you to conduct embodiment experiments on our High Performance Computing (HPC) clusters.

All this can be either done through an easy to use web interface or locally on your machine. That way you can build brains for bodies and bodies for brains."

https://neurorobotics.net/

Neuro-Robotics Platform (HBP SP10)
15. Sept. 2014

7
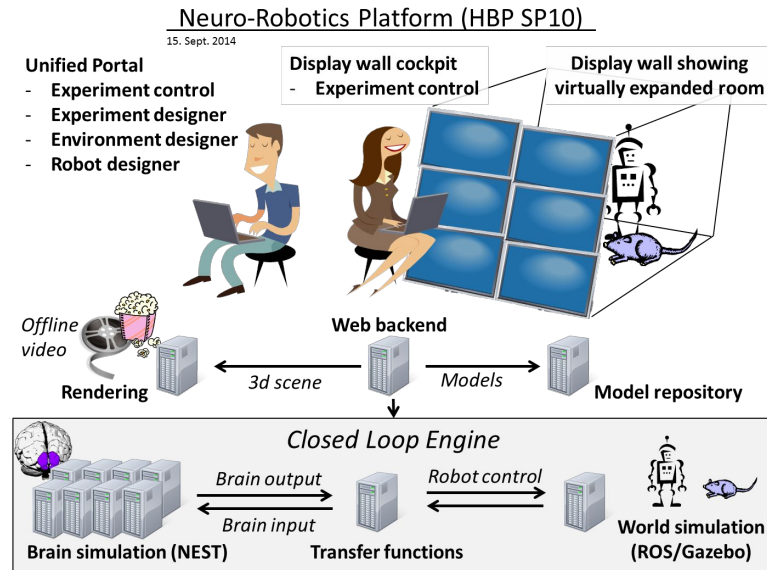
Where to start?

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Install NEST:

1.  NEST can be installed on Linux/MacOS
2.  Download the virtual machine image
    compatible with VirtualBox and VMWare

Run the tutorials:
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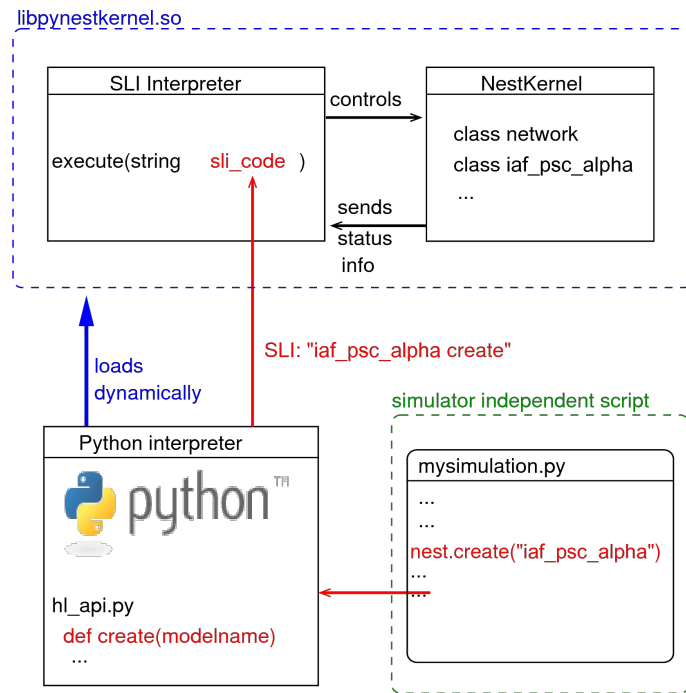
- Neurons and simple neural networks
- Populations of neurons
- Connecting networks with synapses
- Topologically structured networks
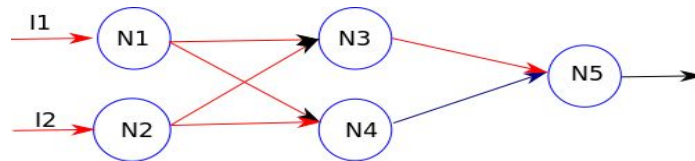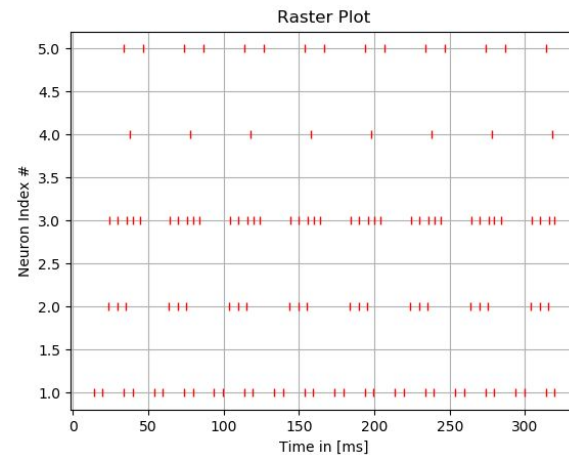
http://www.nest-simulator.org/

8

Simple application

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Implementation on an XOR
gate

- I1, I2 are excitatory
  currents
- Red arrow are
  excitatory currents
- Blue arrows are
  inhibitory currents

INPUT		OUTPUT
A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

Download source code from: https://tinyurl.com/yasqlyw5

9

Discussion

NEST simulator is :

- a very powerful SNN simulator
- being integrated with the Neurobotics platform
- easily parallelizable

NEST provides several examples on how to use advanced features including STDP, probabilistic connectivity, etc.

NEST simulator

Questions?

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