Neurorobotics Platform

The Neurorobotics Platform (NRP) is an integrative simulation framework: it enables in silico experimentation and embodiment of brain models inside virtual agents interacting with realistic simulated environments. Testing procedures that can otherwise be difficult to implement on a physical setup - like testing of safety-critical situations or scenarios that could result in damage to the robot - can now be performed in the NRP without incurring any risk.

Drawing upon the potential of both neurosciences and Artificial Intelligence in robotics, the NRP allows its users to observe, analyse and test the emergence of behavioural patterns in virtual agents controlled by state-of-the-art models of brain architecture and functions. The result is an unprecedented approach to simulation in which theoretical brain models can be checked against data-driven models thanks to simulations that take into account the dynamics of both the environment and of the agent itself.

We believe that this approach is essential to develop novel robotic control technologies that are robust, adaptable and comparable to biological systems.

**Usuarios**

- **Neurocientíficos** que desean probar y perfeccionar sus modelos de funciones cerebrales en experimentaciones de círculo cerrado.
- **Roboticistas** que buscan cumplir con las promesas de la Inteligencia Artificial basada en la neurociencia en forma de Inteligencia Artificial embodizada.
- **Cualquiera** que cree que la embodiment es la vía para avanzar tanto en la investigación cerebral como en la robótica.
FEATURES

✓ Open source and open access.
✓ Fully customizable models and environments.
✓ High performance computing resources available for experiments online.
✓ Ready-to-use model library: from rigid/body robots to compliant tendon-driven robots and musculoskeletal simulations.
✓ Multiple simulators (e.g. NEST, TensorFlow, Nengo) support brain simulations with spiking neurons, controllers synthesized through deep learning, custom hybrid controllers, etc.
✓ Interoperability with HBP model repositories.

TECHNOLOGY READINESS LEVEL

Examples of experiments implemented on the NRP

APPLICATIONS

*In silico* neuroscience, to improve and refine novel models of brain architecture and functions.

Cognitive robotics, i.e. robots with enhanced contextual awareness and decision-making capabilities for use in autonomous exploration (deep sea, space), search and rescue in disaster areas, and more.

Testing and verification of robotic behavior, even under safety-critical situations.

Co-design of robotic body and controller for advanced robotics.

For more information, please visit: [http://www.neurorobotics.net/](http://www.neurorobotics.net/) or contact Prof. Dr.-Ing. habil. A. Knoll at [knoll@in.tum.de](mailto:knoll@in.tum.de)