



NeuiCub

The NeuiCub platform is composed of an iCub robot controlled through a SpiNNaker neuromorphic board (SpiNN-5). It is meant for neurobotic experiments that involve detailed brain models implemented with spiking neural networks. The SpiNNaker neuromorphic platform comprises arrays of low-power, parallel custom chips (each containing 18 ARM9 cores) running a digital software simulation of neurons and synapses. The SpiNN-5 board includes 48 processors. The system's philosophy focuses on large brain simulation and spike communication in real time whilst scaling up to biological scale. A standard SpiNNaker neural model is primarily configured through the provision of the "sPyNNaker" implementation of the Python-based PyNN modeling framework. The version of the iCub humanoid robot available at the BioRobotics Institute is provided with one head that has 6 degrees of freedom (dofs), 3 for eyes and 3 for neck control), two arms (7 dofs each) and one hand (3 dofs for the thumb, 2 for the index, 2 for the middle finger, 1 for the coupled ring and little finger, 1 for the adduction/abduction). The iCub robot available at the BioRobotics Insitute is equipped also with an inertial sensor, two dragonfly cameras and tactile sensors in the hand.



Key Features

- Touch sensors embedded in the iCub hand
- Closed-loop mechanisms (data exchange and synchronization) between SpiNNaker board and iCub robot already implemented
- Simulating up to 200K neurons in the SpiNNaker board
- YARP interface and iCub control modules available
- Stereo vision and inertial sensor

Possible Applications

- Grasping, Manipulation
- Testing of neuroscientific models (brain-based controllers)
- Neuromorphic Control
- Gaze control
- Gaze guided manipulation

Access information

Corresponding infrastructure	School of Advanced Studies Sant'Anna The BioRobotics Institute
Location	Viale Rinaldo Piaggio, 34 56025 Pontedera PI, Italy
Unit of access	Working day



Technical specifications

Power supply	12V@5A peak for SpiNNaker board
Interface	2xEthernet
DoFs	9 for the hand
Camera resolution	640×480

Additional information

SpiNNaker webpage: <http://apt.cs.manchester.ac.uk/projects/SpiNNaker/>

SpiNNaker API documentation: <http://spinnakermanchester.github.io/>

iCub user manual: <http://wiki.icub.org/wiki/Manual>