

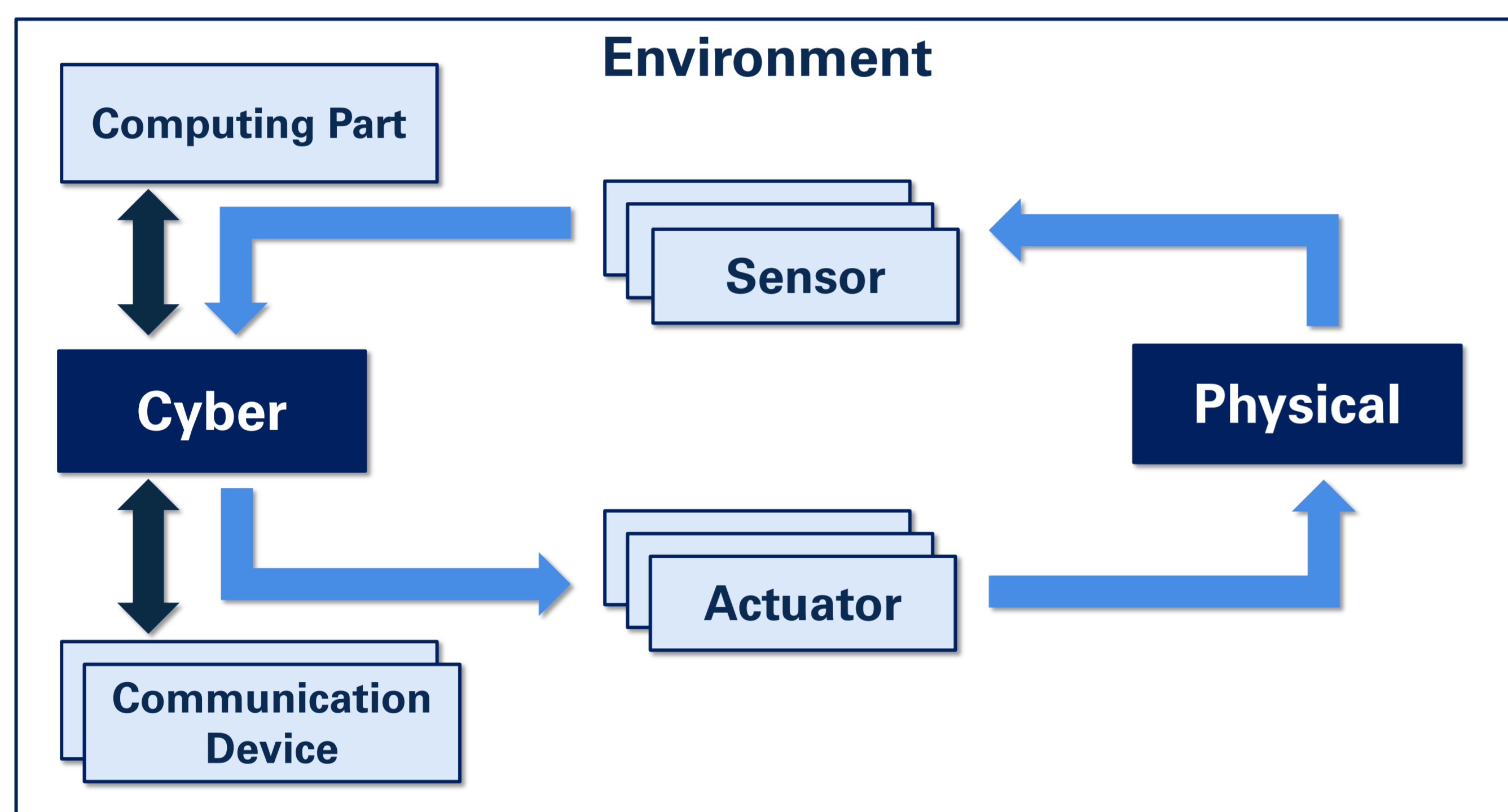


Nao – A Humanoid Robot as Part of a Cyber-Physical System

Context

Cyber-physical systems (CPSs) are self-regulating complex systems comprised of interconnected virtual and physical systems. In the near future, such systems will become more and more pervasive. That is, **large amounts of interconnected distributed systems** are spread over the world with growing density and coverage. This new type of system calls for novel engineering techniques. In **QualiTune** we focus on **novel software engineering techniques**.

The Nao humanoid robot embodies the nature of future devices: sensors, actuators, communication devices and a computing part. Students looking for a major or minor thesis, internships or another kind of participation are welcome to contact us. Three areas of interest are shown on the right hand side of the poster.



Nao

2 cameras

4 microphones

25 motors

Communication
Devices
Ethernet
WiFi

each motor with
temperature
and current sensors



Several LEDs

Speakers

Computing
Part
500 MHz CPU
Linux OS

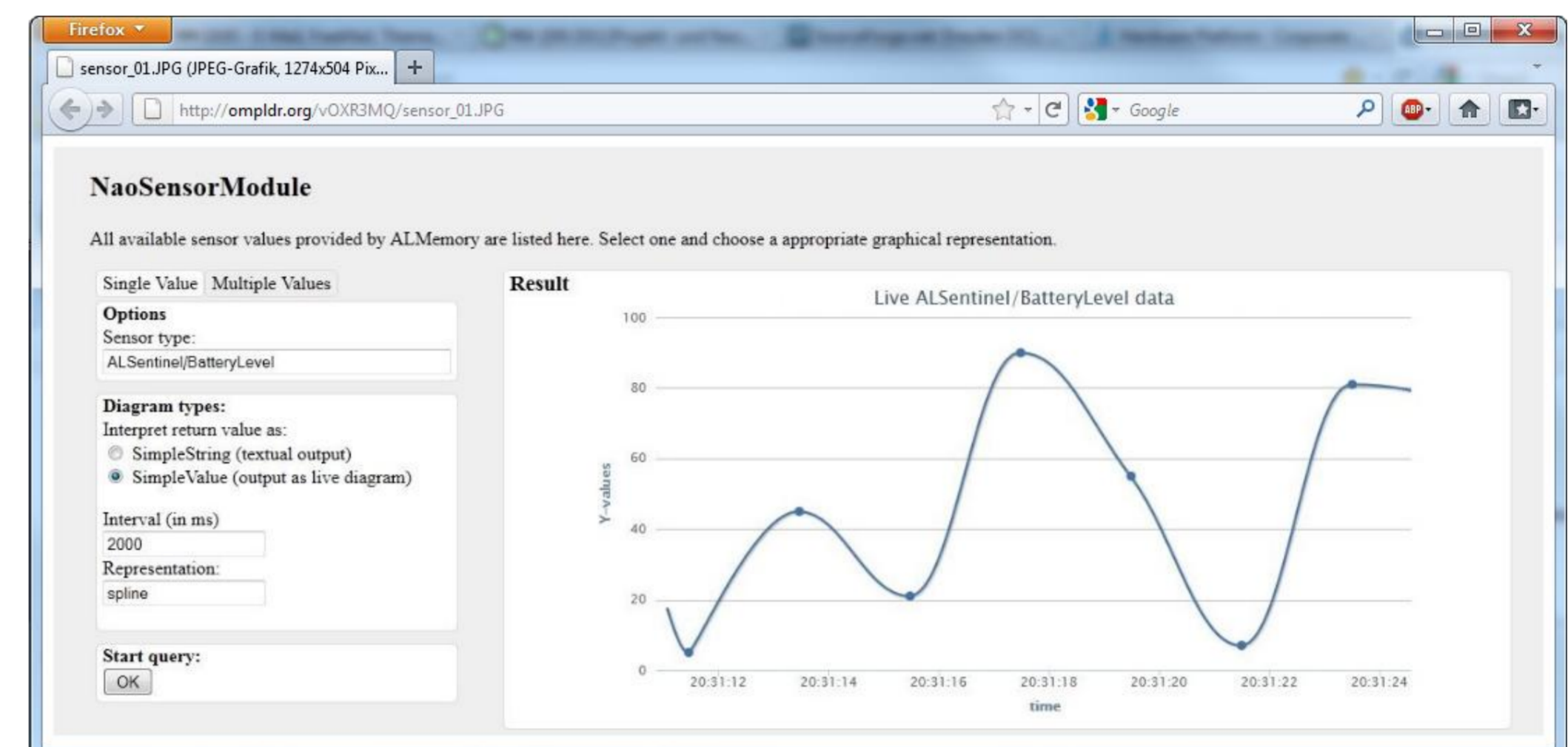
tactile sensors

infrared
receiver/transmitter

ultrasonic
receiver/transmitter

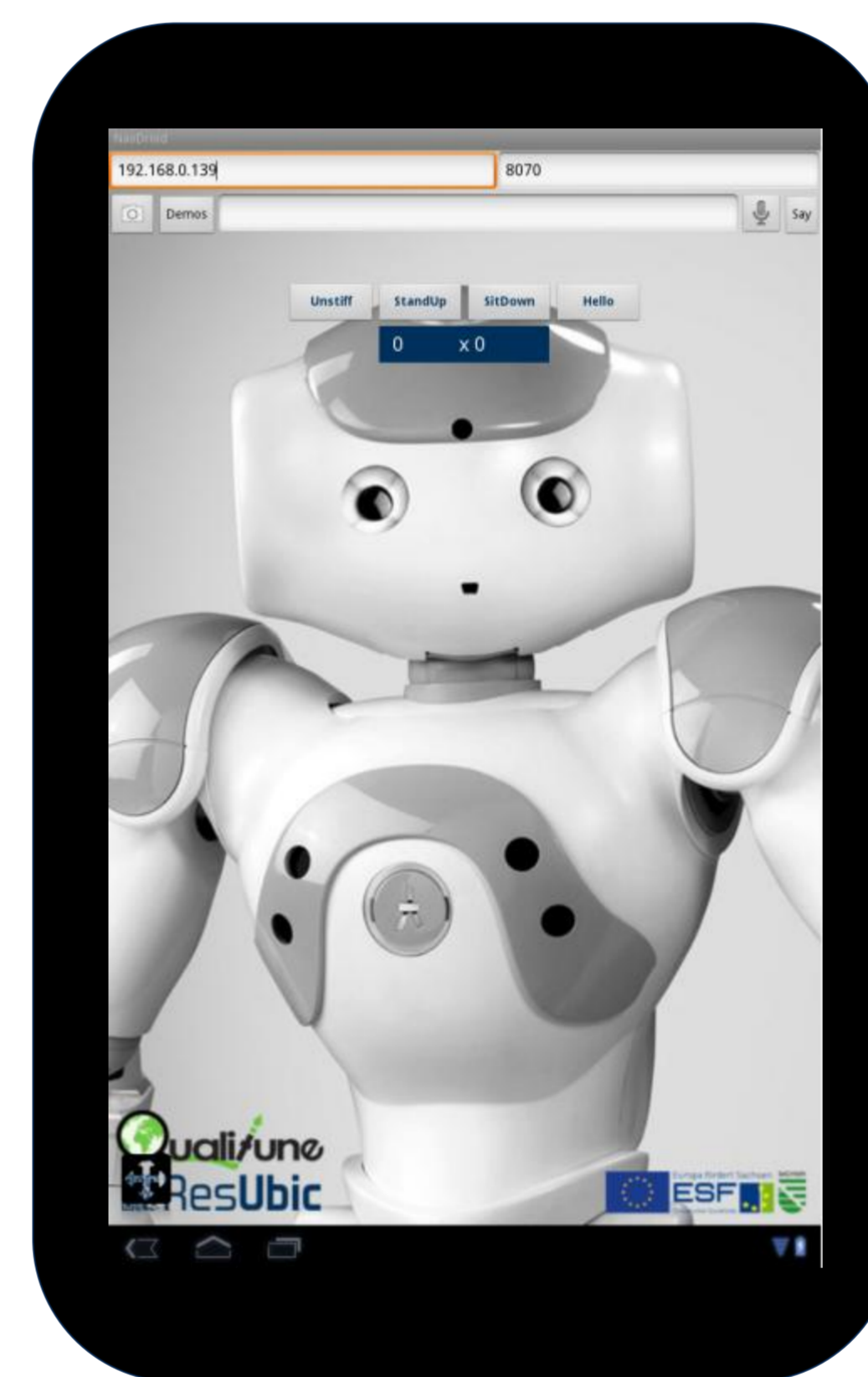
NaoService

NaoService is a small web service providing a RESTful SOA designed for extensibility using modules. The complete Nao API (NaoQi) can be accessed via web browsers or generated proxies for the GPL of your choice. Furthermore, visualization of sensor values (e.g., energy consumption) is provided.



<http://code.google.com/p/naoservice/>

NaoDroid



NaoDroid is an Android app that allows controlling a Nao from an Android smart phone or tablet. NaoDroid uses NaoService to transmit commands to the Nao. Besides, NaoDroid can display pictures from the Nao's cameras to give an impression of its current location and environment.

NaoText

NaoText is a textual domain-specific language (DSL) to program collaborative applications for multi-Nao scenarios in a role-based way. NaoText applications can be executed by a Java-based interpreter that uses NaoService.

NaoText allows abstracting from general purpose language and provides means to statically analyze and predict the non-functional behavior of Nao applications (e.g., their average energy consumption or worst case execution time).

