



# Whole Body Interface Toolbox (WBI-T): A Simulink Wrapper for Robot Whole Body Control

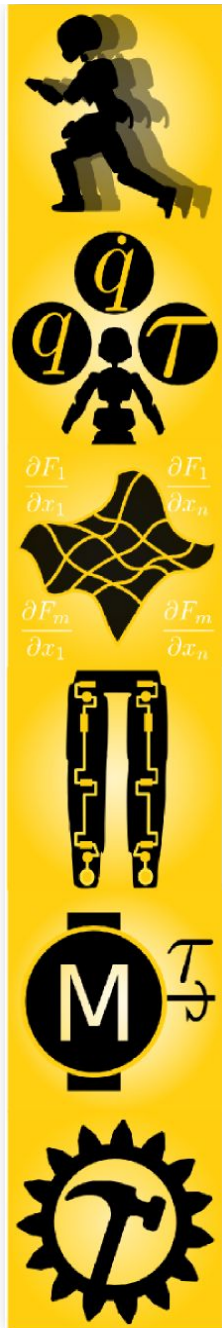
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# Overview

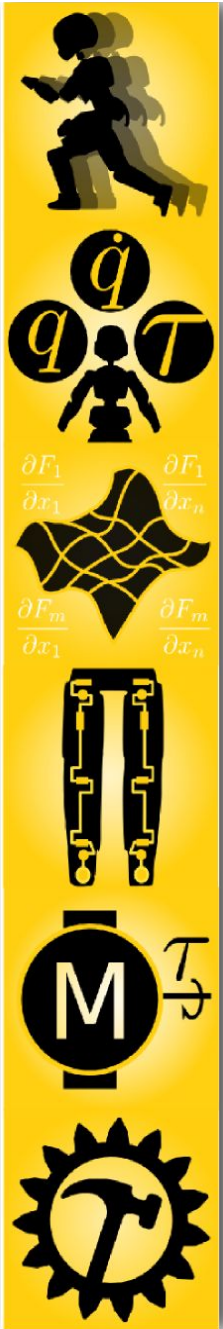
- Motivations
- Features and description
- Dependencies and System Requirements
- Whole Body Interface
- Implementing a controller (Demo)
- Working with the real platform



# Under the Hood

## The YARP Middleware

"It is a set of libraries, protocols, and tools to keep modules and devices cleanly decoupled. It is reluctant middleware, with no desire or expectation to be in control of your system"



# Motivations



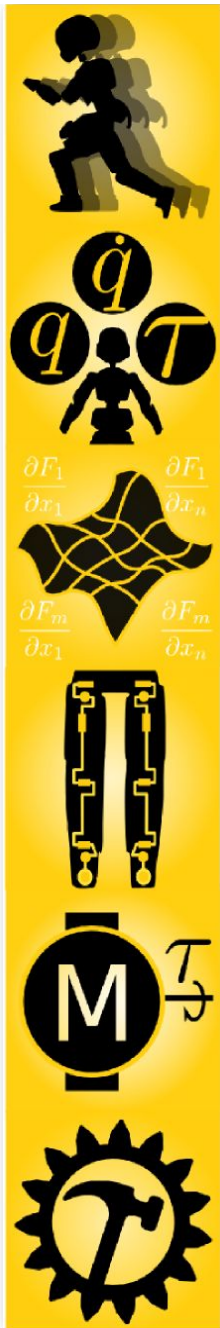
- "Rapid prototyping" of controllers.
- Better alternative to the use of YARP JAVA bindings
- Exploitation of **Simulink** and **MATLAB** toolboxes
- Higher level of **abstraction** for humanoid robot interfaces.
- Motivate non-programmers roboticists to approach the real platform.

# Description & Features

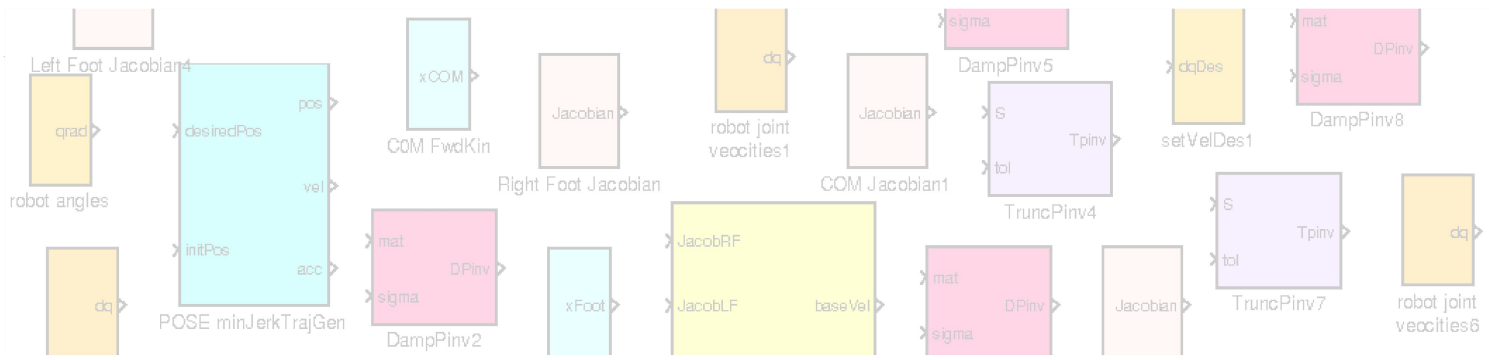
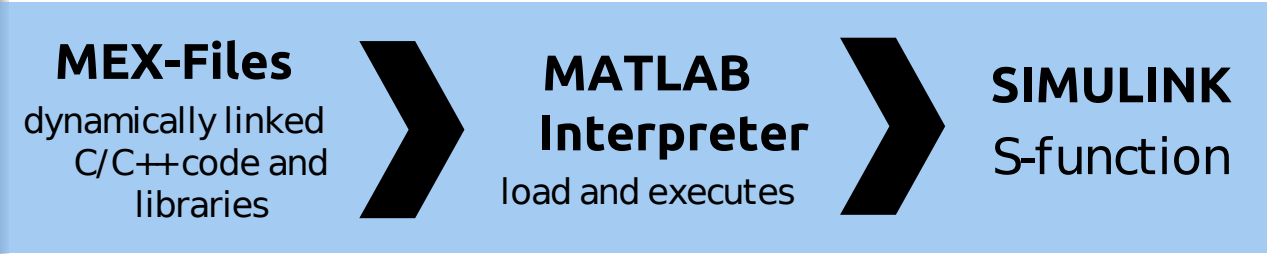
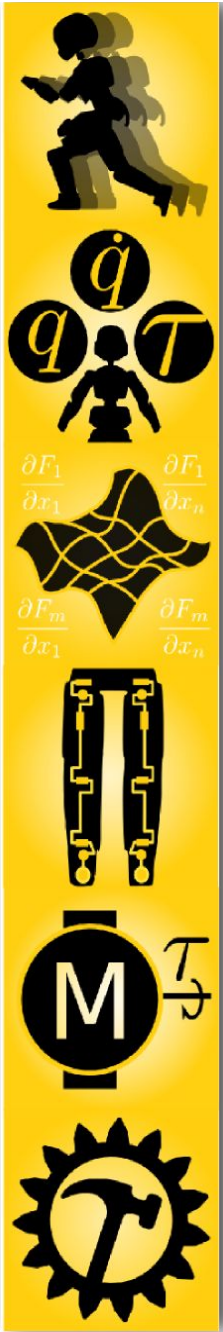
Simulink blocks wrapping a YARP-based implementation of the Whole-Body Interface (WBI) [1] C++ library. WBI acts as an abstraction layer for any interaction with the robot, making code robot-independent.

- Easy interface with YARP based humanoid robots.
- Instantaneous transfer of simulation results onto the real platform.
- Deals with both fixed and floating base humanoids.
- Synchronization with YARP! Important aspect in the design and use of controllers in simulation.
- Supported OS: Linux, Mac OS X, Windows.

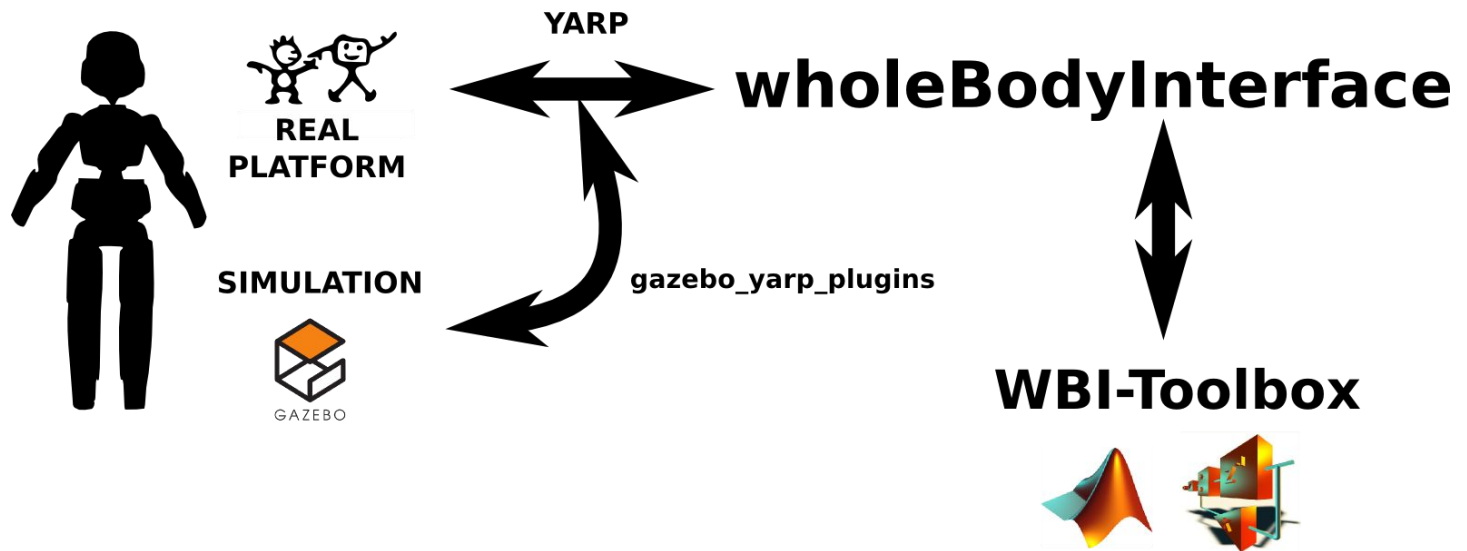
[1] Andrea Del Prete, Silvio Traversaro, and Marco Randazzo. Whole body interface. [http://wiki.icub.org/codyco/dox/html/wbiy\\_8h\\_source.html](http://wiki.icub.org/codyco/dox/html/wbiy_8h_source.html) , 2013.



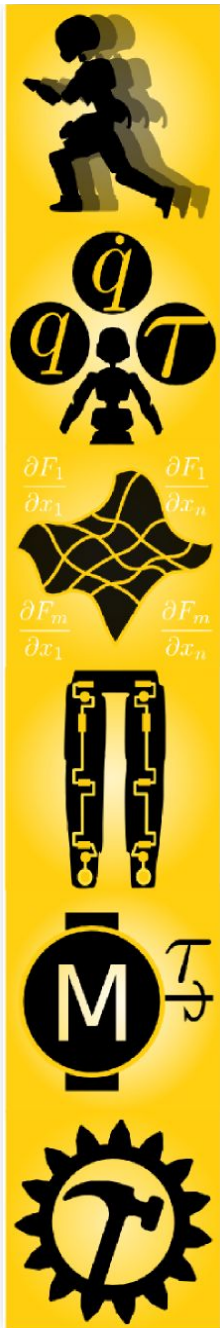
# Whole Body Interface Toolbox



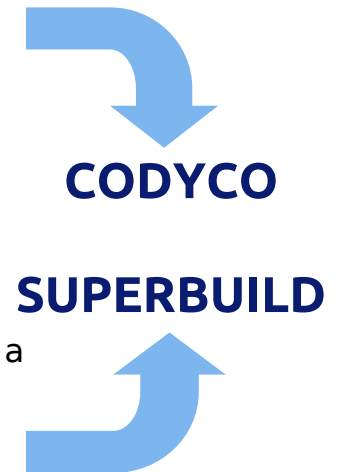
# Whole Body Interface Toolbox



# Dependencies and System Requirements



- **YARP** - Robotics middleware.
- **iCub Software** - Not strictly necessary
- **CoDyCo Software**
  - **iDynTree Library**
    - YARP based Robot dynamics library
  - **wholeBodyInterface Library**
    - Library defining a general interface for communicating with a floating-base rigid robot
- **Gazebo or iCubSim simulator.**





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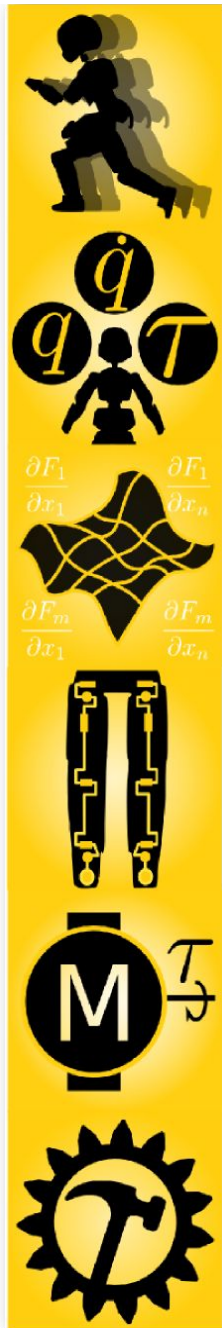
**RELIABLE!**

**FAST!**

# Under the Hood

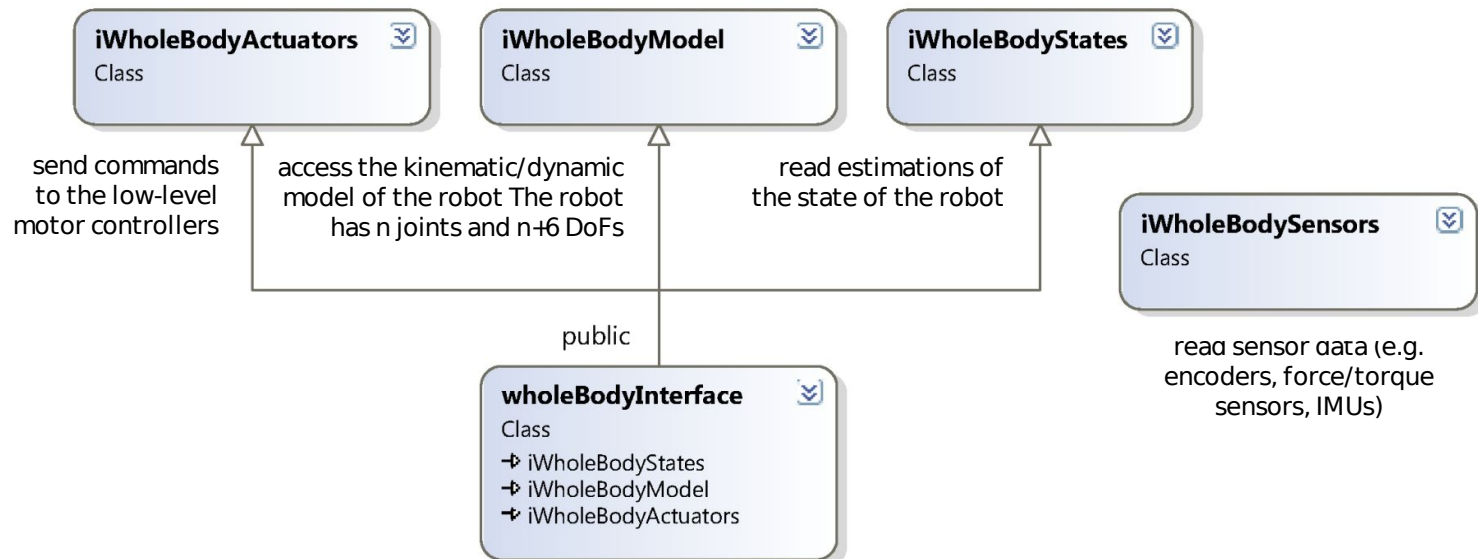
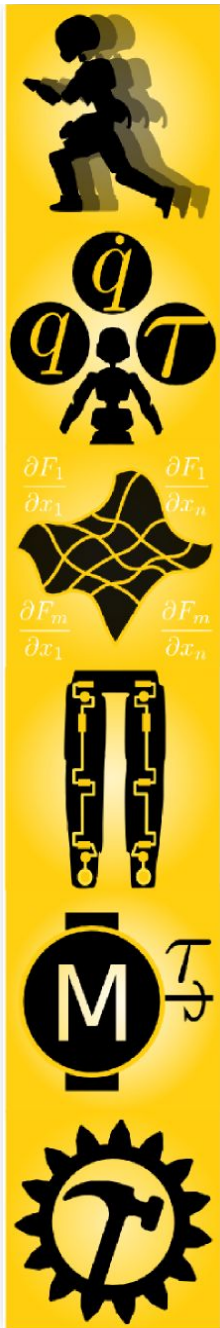
wholeBodyInterface Library

C++ template library defining a general interface for communicating with a floating-base rigid robot.




# Under the Hood

## wholeBodyInterface Library

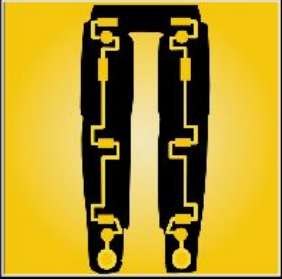


# Implementing a Controller

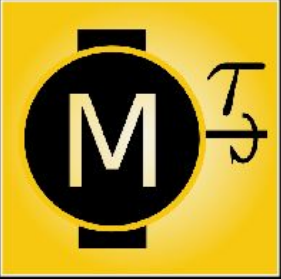





wholeBodyStates



wholeBodyModel



wholeBodyActuators



Utilities

**WHOLE BODY INTERFACE TOOLBOX**

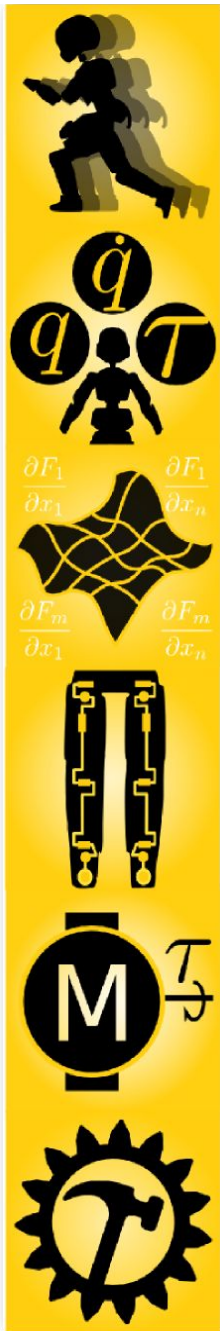
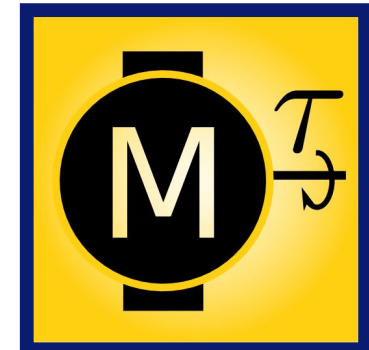
This software was supported by the FP7 EU Project CoDyCO (No. 600716 ICT 2011.2.1 Cognitive Systems and Robotics (b))  
<http://www.codyco.eu>

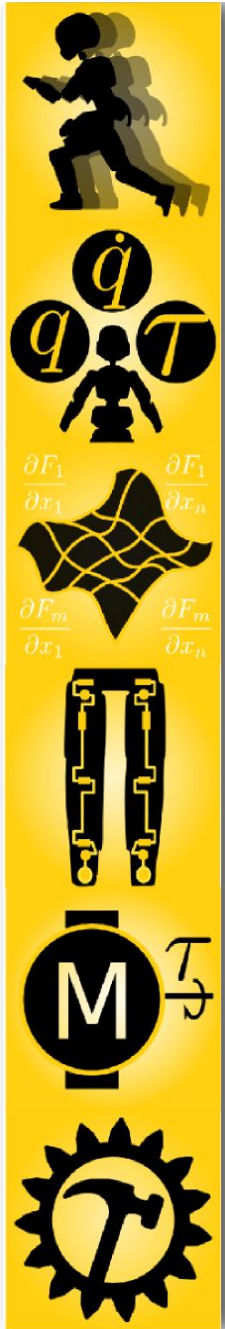
Toolbox's main screen and subsections.

# Implementing a Controller

Whole Body Impedance Controller quickly implemented on Matlab

$$-K_p(q_j - q_{j0}) - K_d\dot{q}_j + g = \tau_j$$





# The Real Platform

The Whole Body Controller in the following video is being run on Simulink  
[http://www.youtube.com/watch?v=jaTEbCsFp\\_M](http://www.youtube.com/watch?v=jaTEbCsFp_M)

# More Information



**Installation instructions:**

<http://github.com/robotology/codyco/tree/master/src/simulink>

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