iCub
mechatronics

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iCub Facility

ISTITUTO ITALIANO
DI TECNOLOGIA









iCub

iCub2

53	DOF
29	kg
+4800	parts
+2000	sub-assemblies

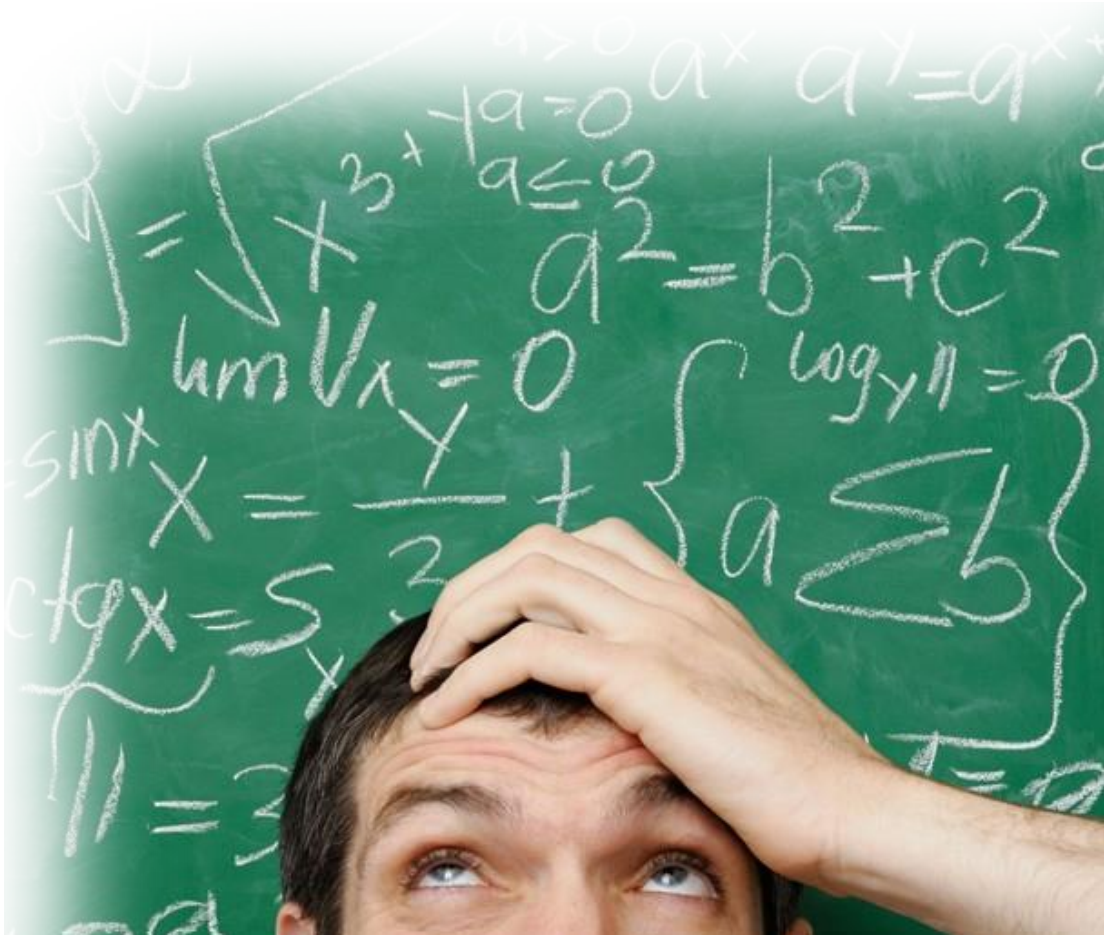
6 months to build a robot

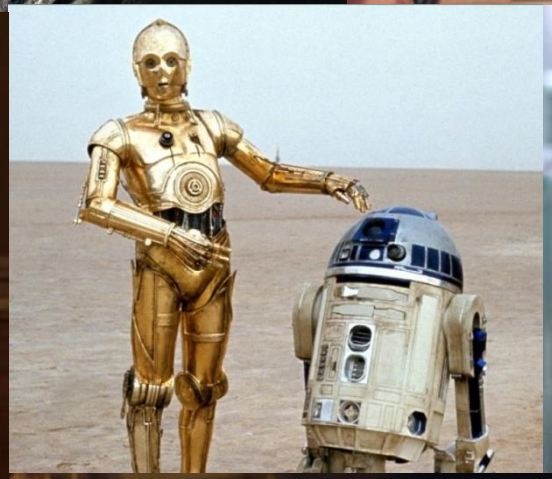
cost: **250.000€**

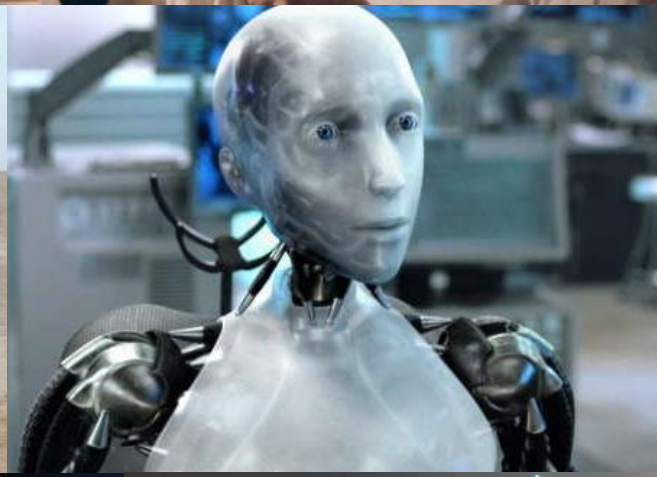
open **hardware**

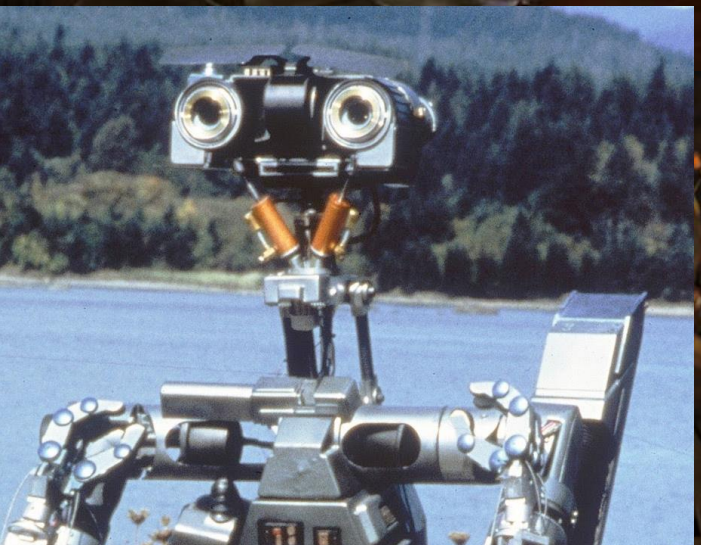
UPMC PARIS UNIVERSITAS
UNIVERSITAT POMPEU FABRA
EPFL ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE
Inserm Instituts thématiques
iit
University of Hertfordshire
Imperial College London
Universität Bielefeld
METU MIDDLE EAST TECHNICAL UNIVERSITY
UNIVERSITY OF PLYMOUTH
SCUOLA SUPERIORE SANT'ANNA PISA
FIAS Frankfurt Institute for Advanced Studies

…designing humanoid robots is **HARD**…

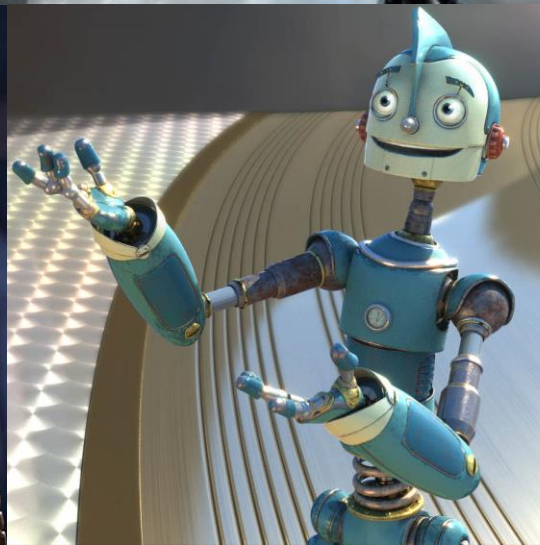






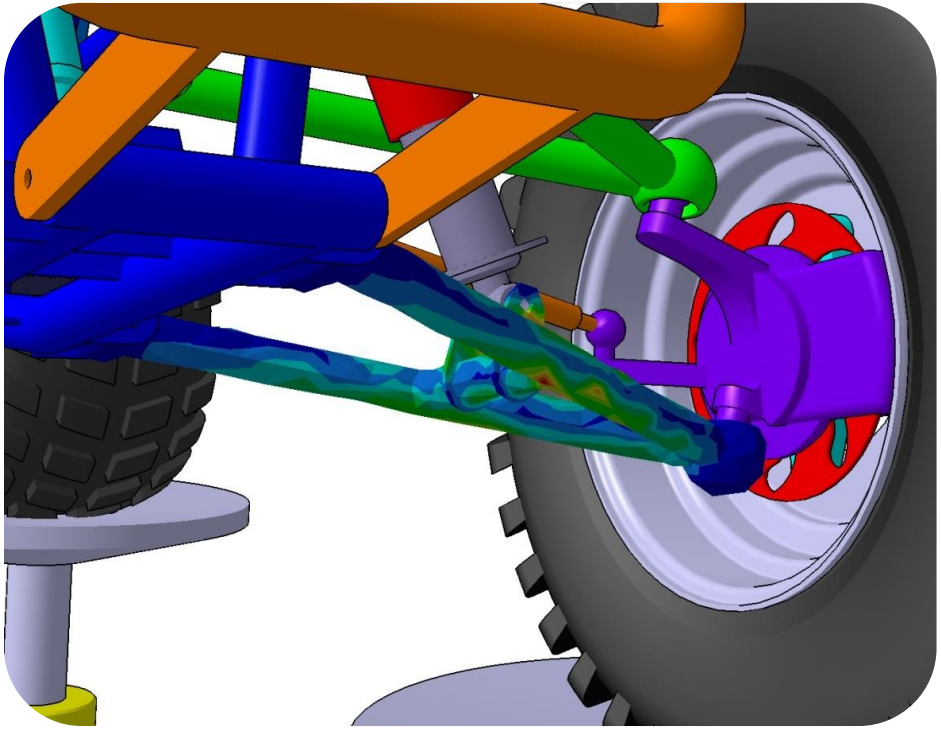


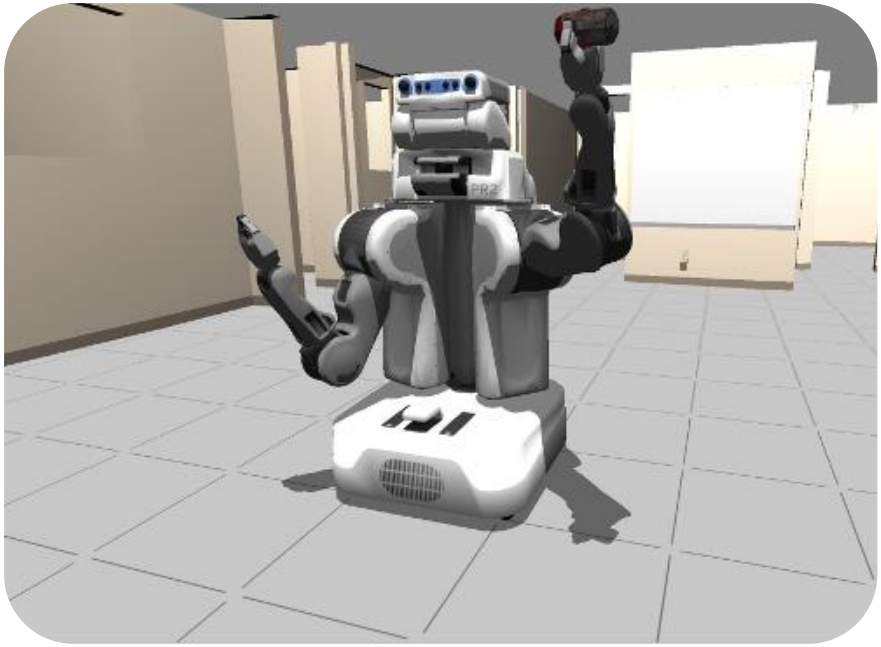

WALL·E



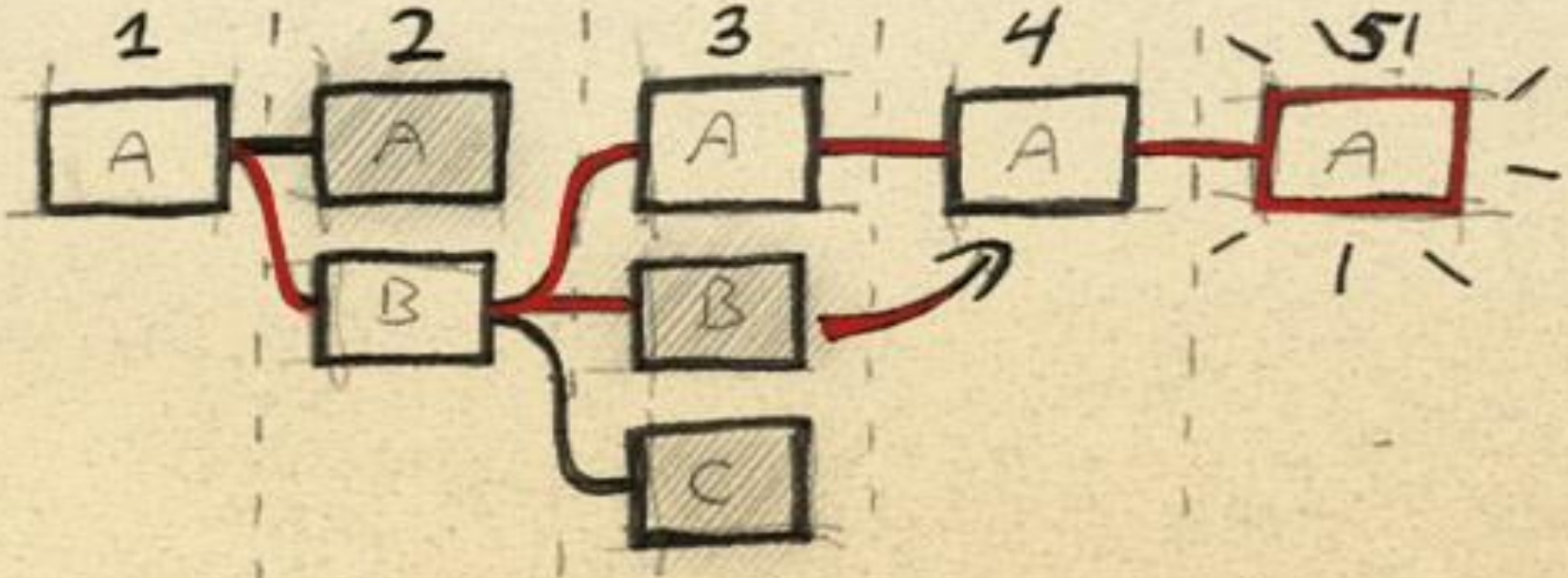
difficult to define functional specifications

simulations





iterative design




ASIMO
HONDA

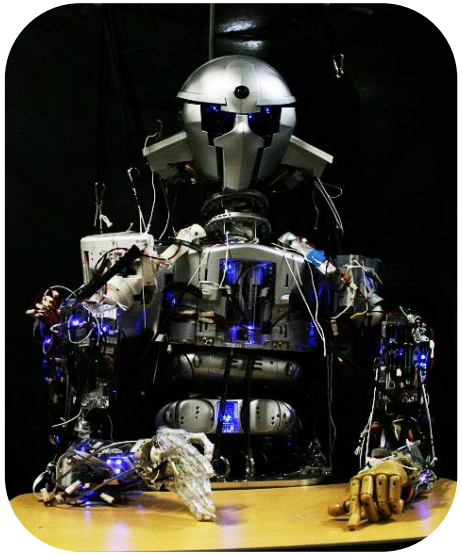

HRP

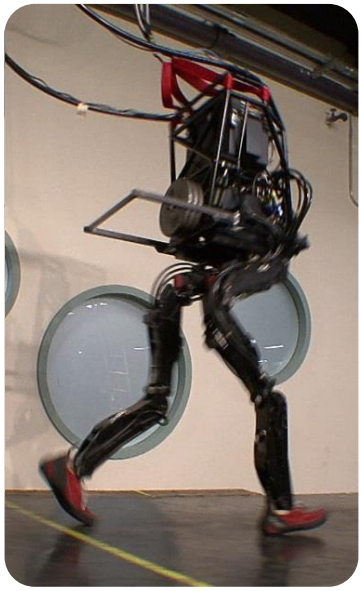


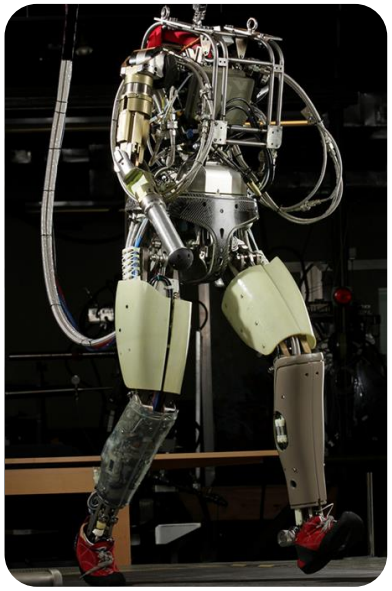


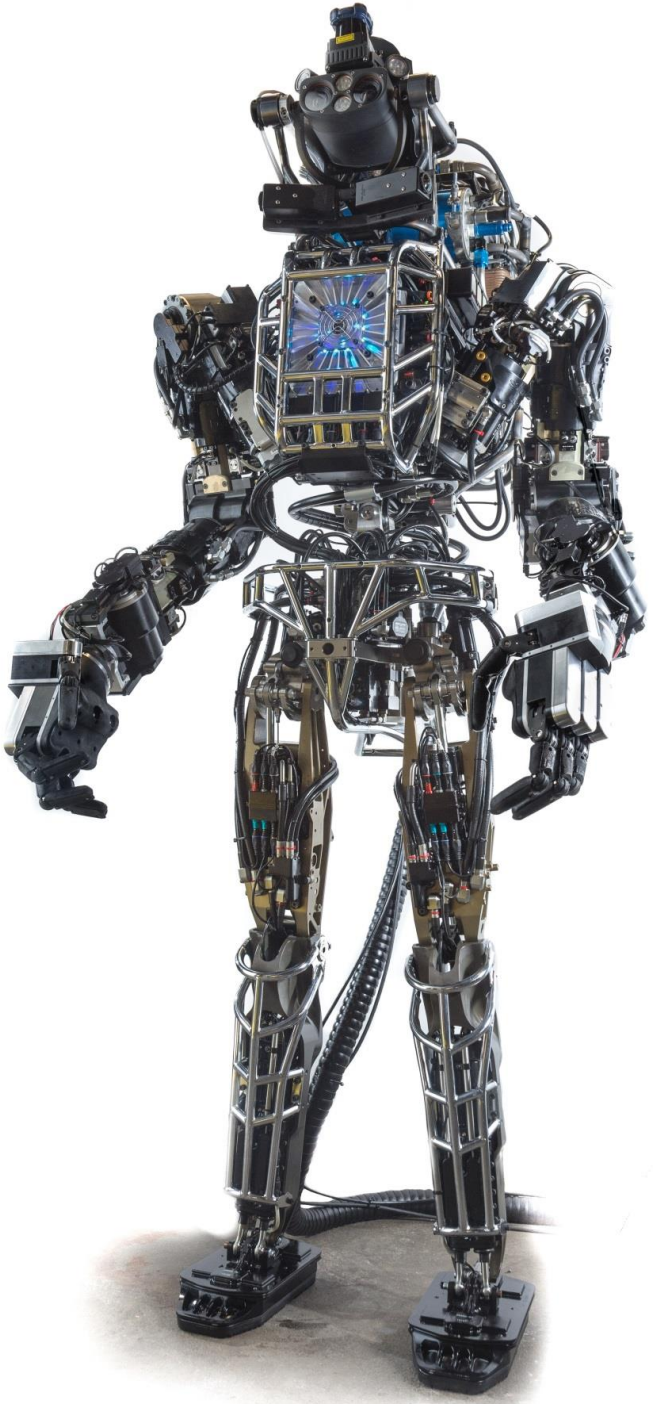


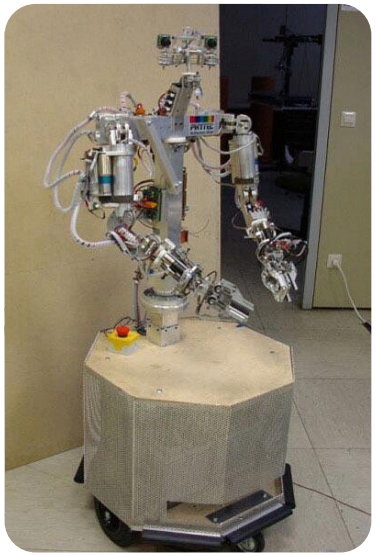


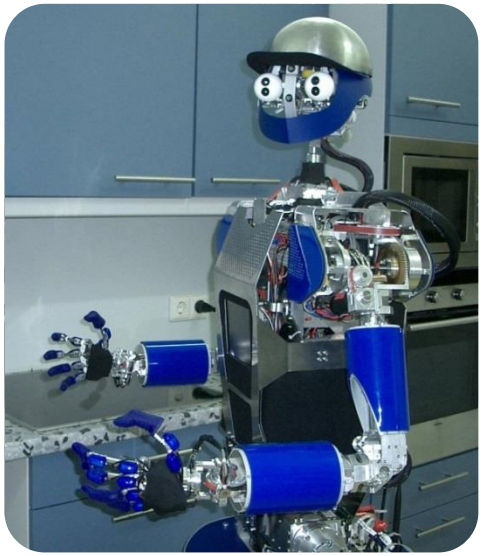




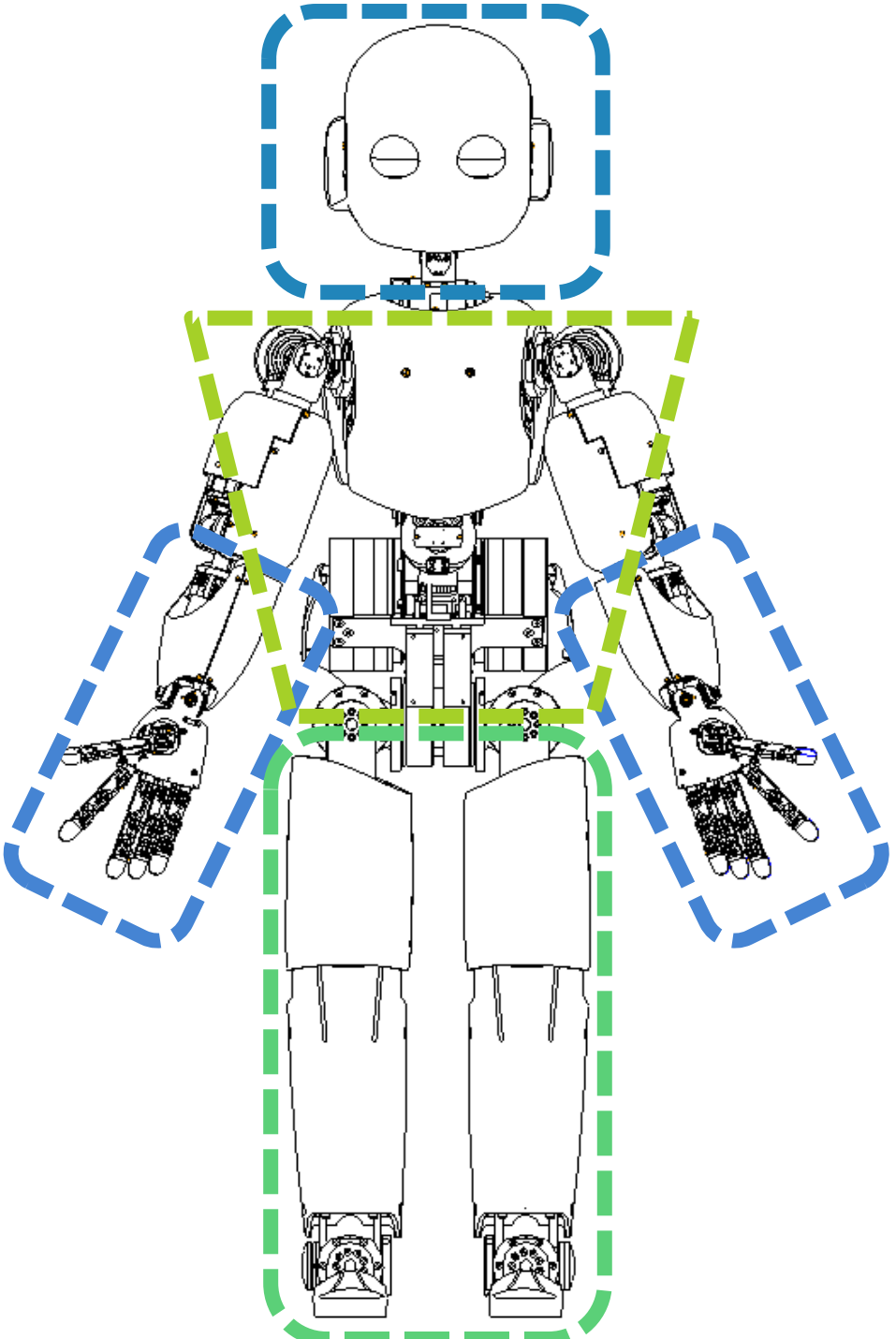




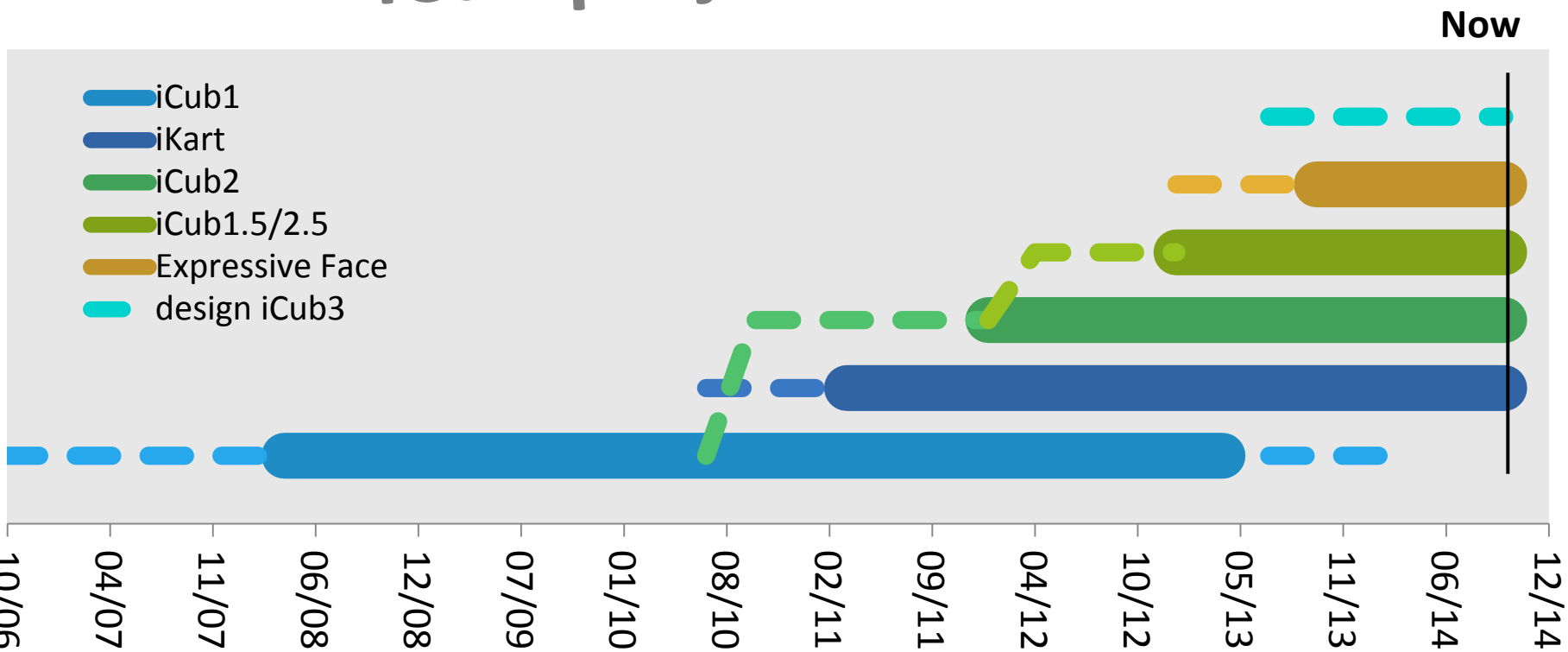


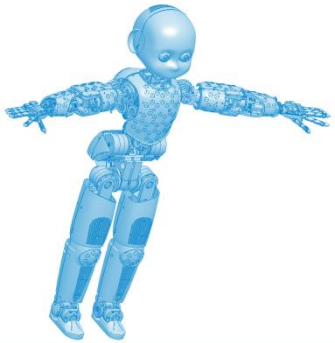
…what about iCub?

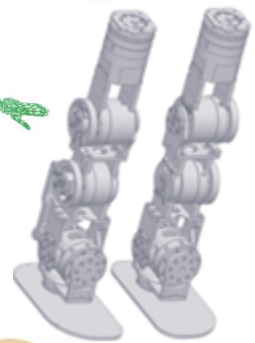
sectional modularity



iCub project timeline



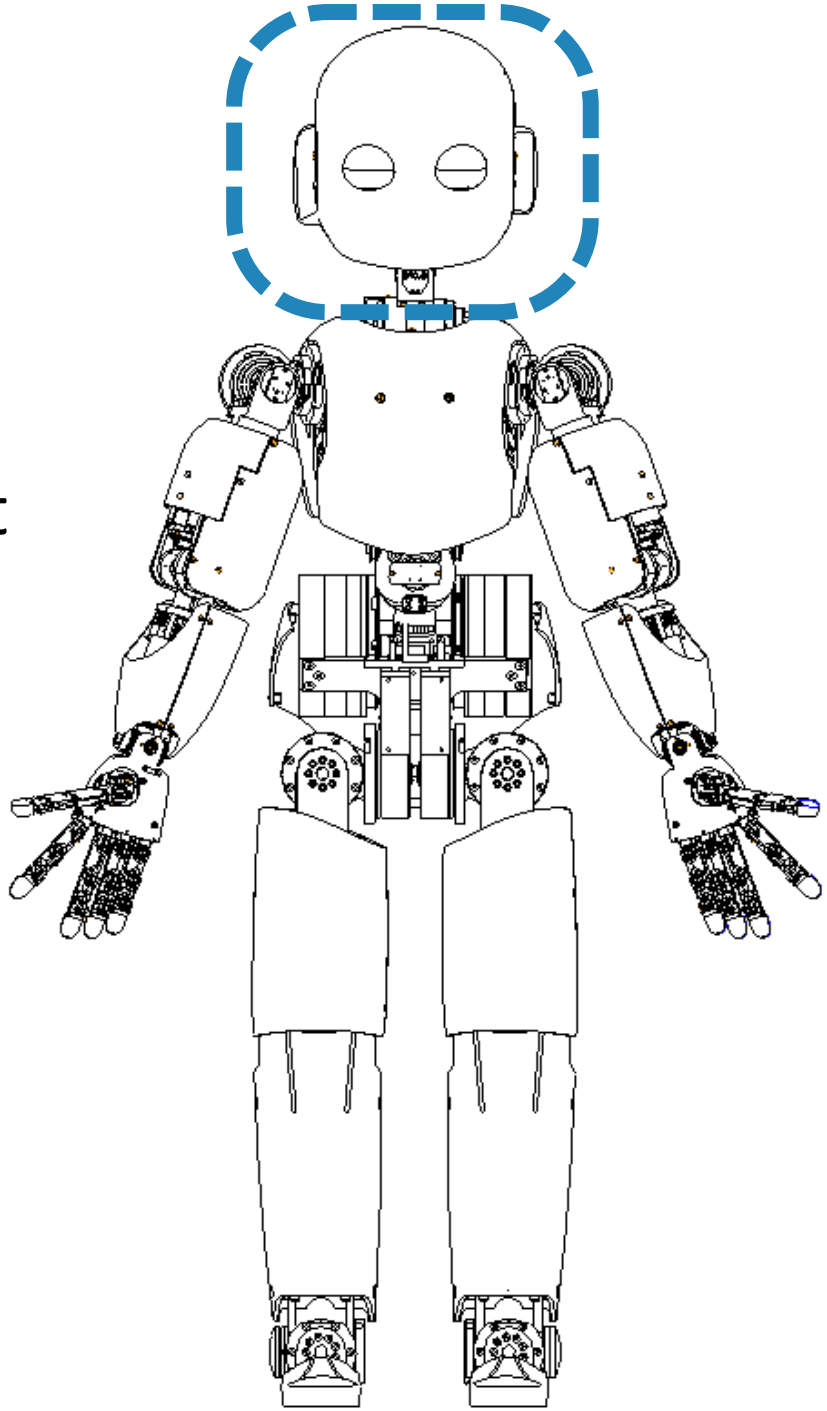




EXPRESSIVE FACE for speech perception

(collab. With GIPSA lab. Univ. Grenoble)

- Articulated jaw movement
- Silent fan-less PC104
- Actuated lips (4DOF)
- High quality stereo microphones (soundmann OMKII)
- on-board loud-speaker
- new eyelids mechanism



[FACE SPEECH SYNC VIDEO]

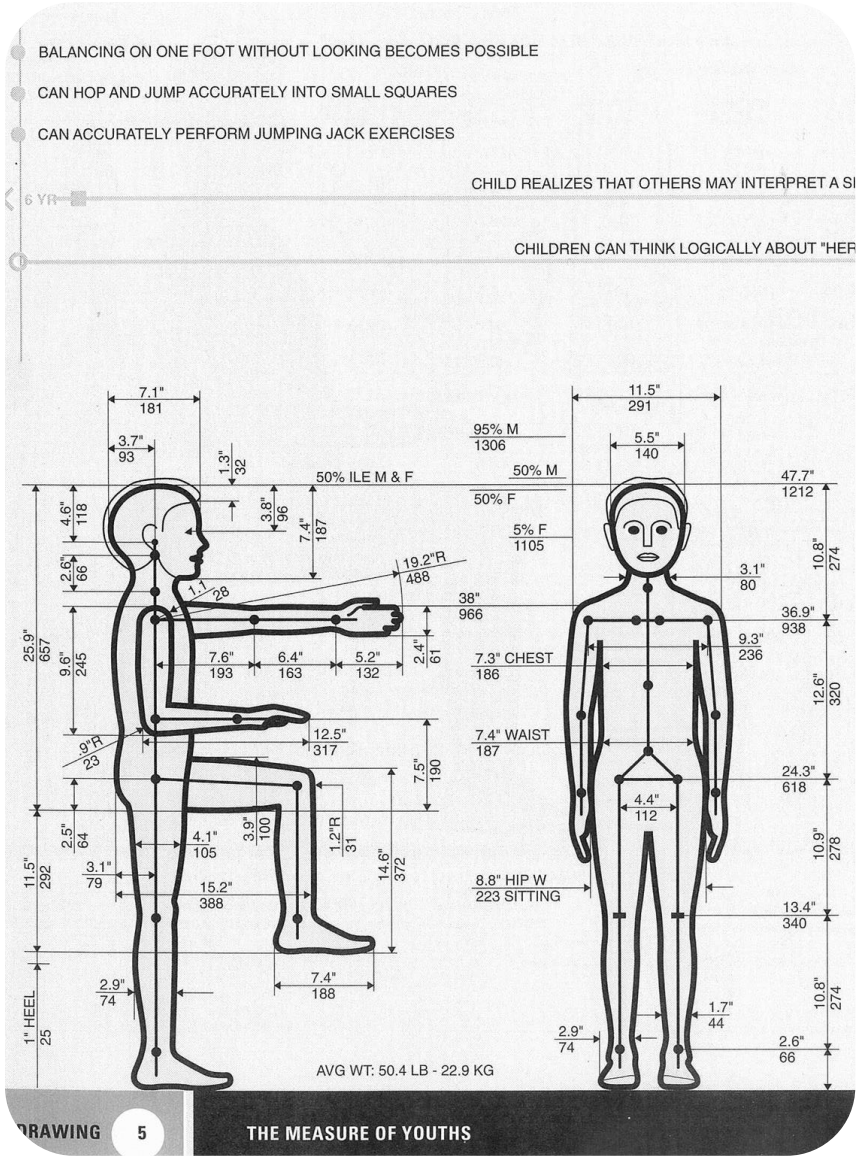
More details at the Novel Mechanism
Design session tomorrow

iCub3

FEATURES

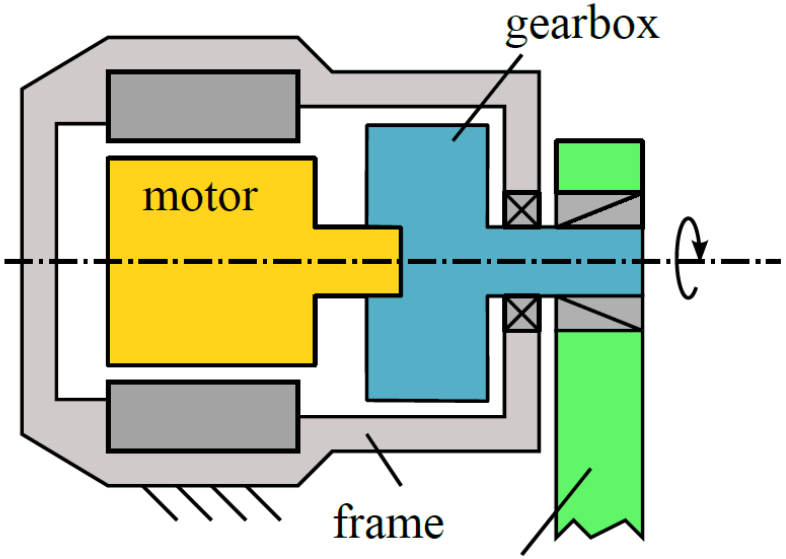
- a little taller (from 1m to 1.2m)
- no cable drives
- serial kinematics
- lower cost
- fully enclosed covers
- improved bimanual workspace
- higher robustness

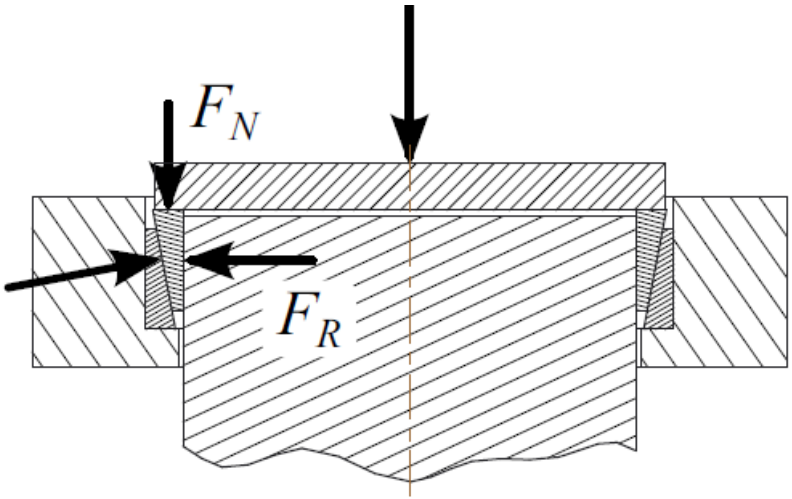
size and kinematics

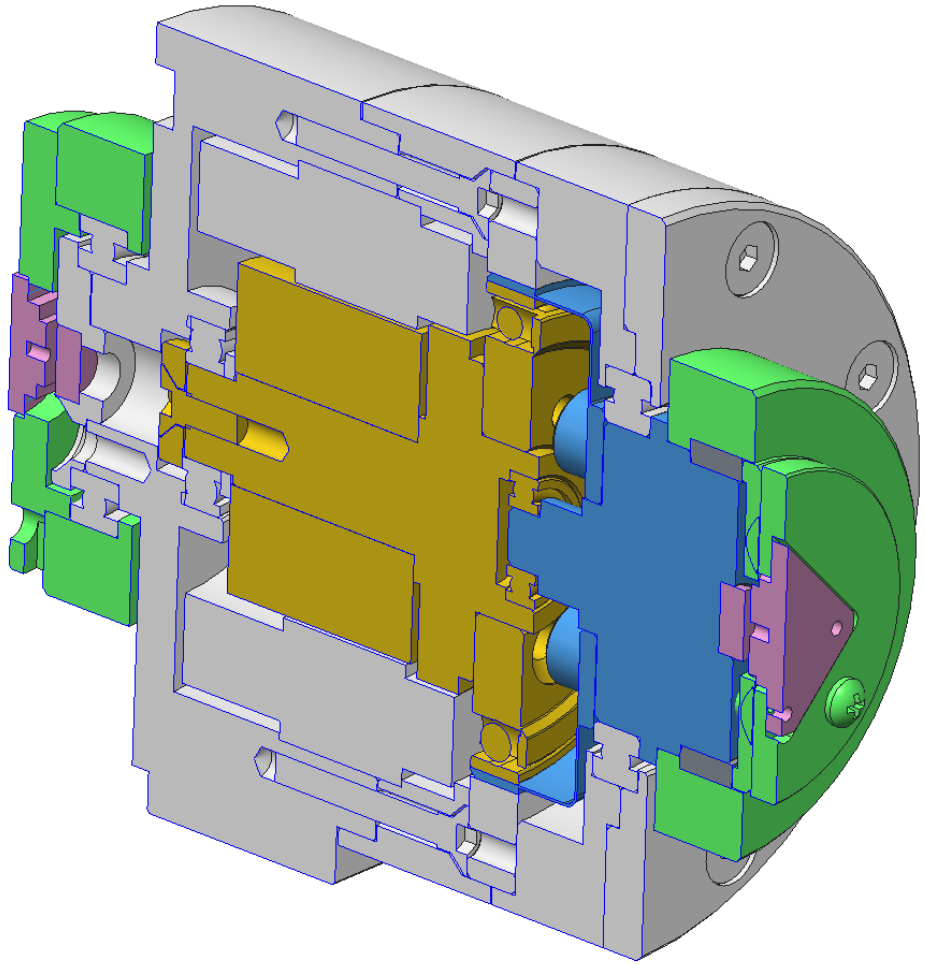


anthropometric tables provide the dimensions for the 7 years old **standard child**

Friction lock output

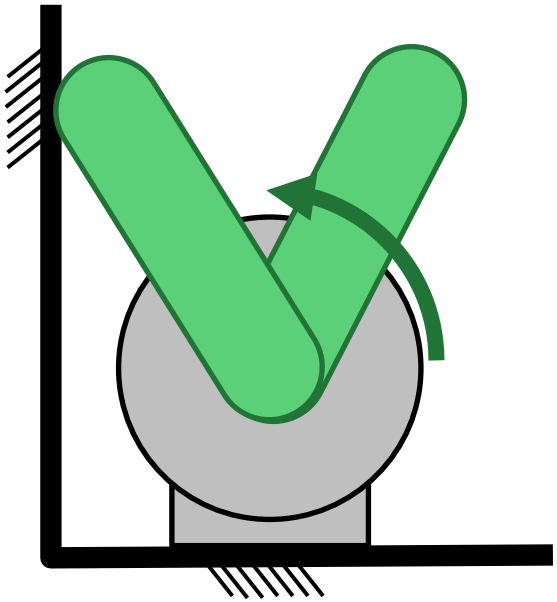


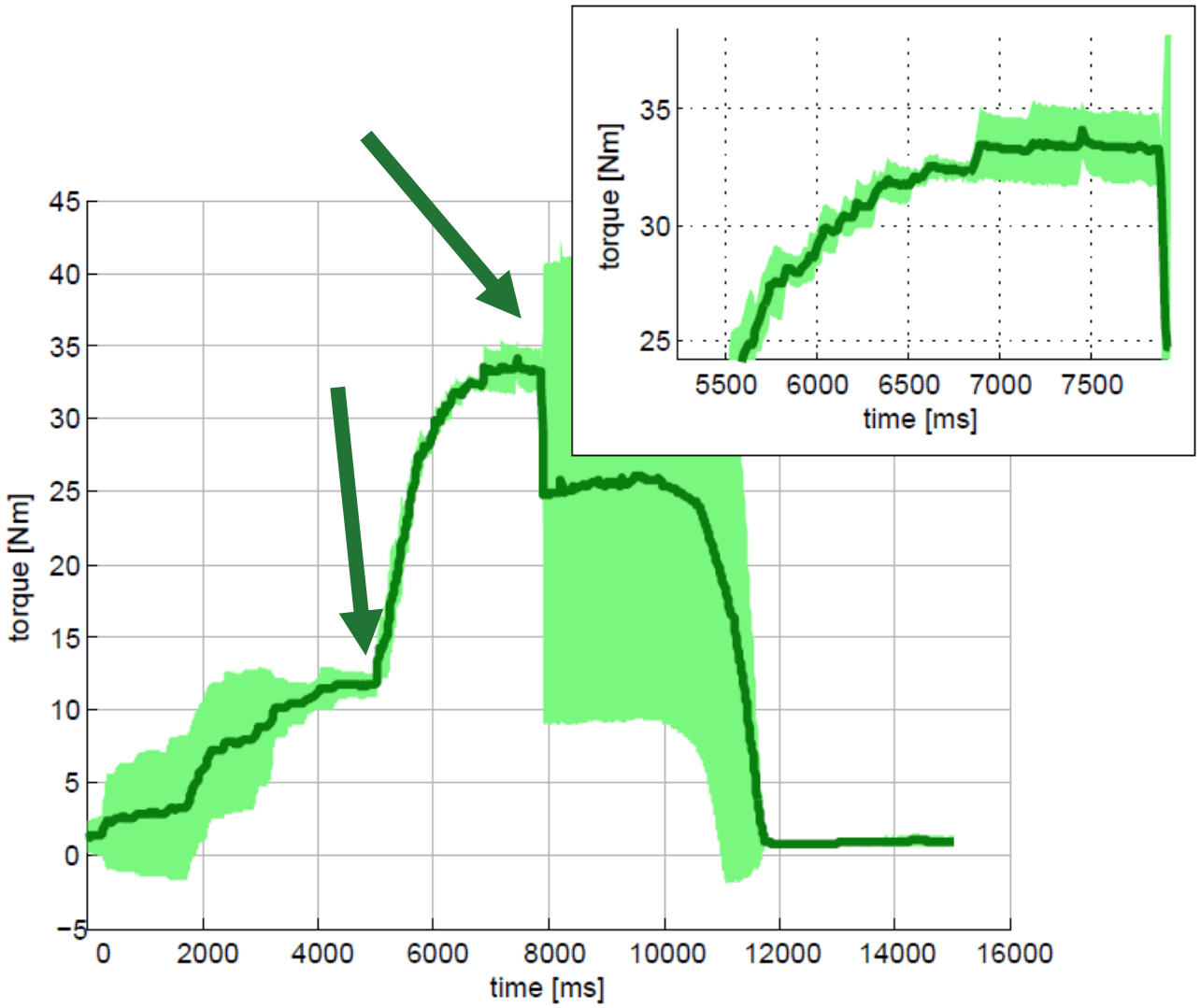




Parmiggiani et. al., IROS2014

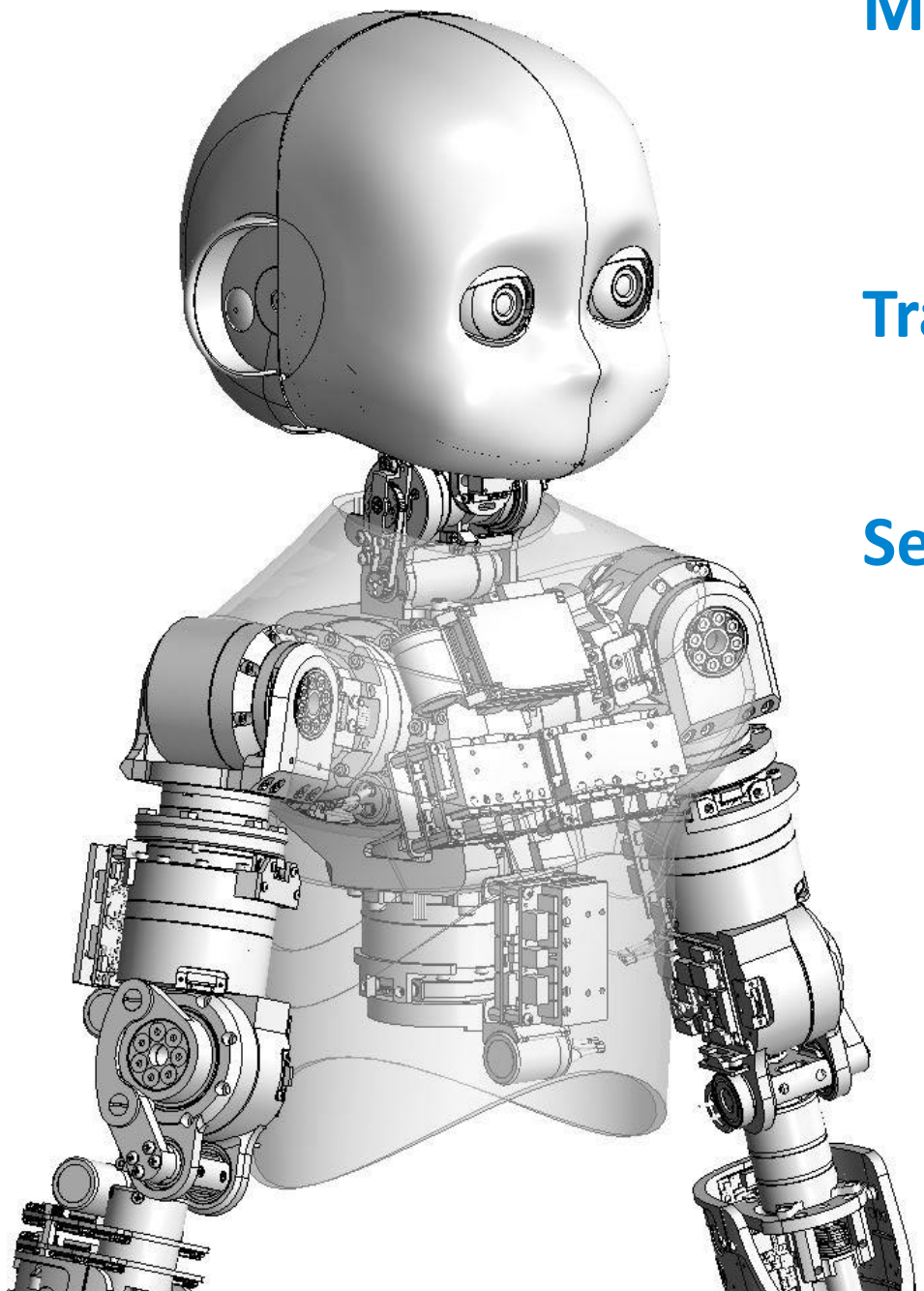
the experiment





Workspace optimization

[REACHING VIDEO]



Motors:

Custom 60W and 110W BLDC by MOOG

Transmissions:

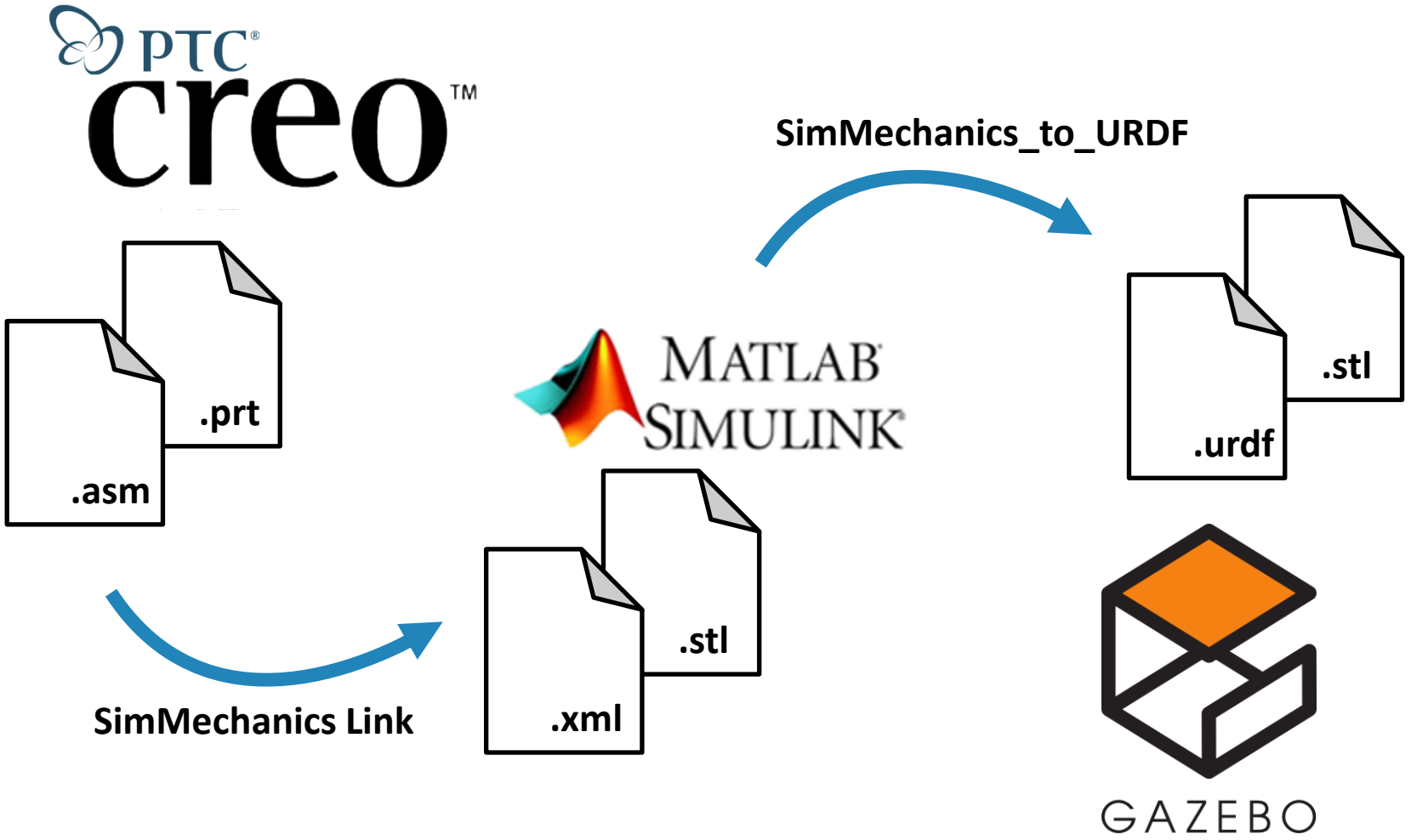
100:1 HD speed reducers

Sensors:

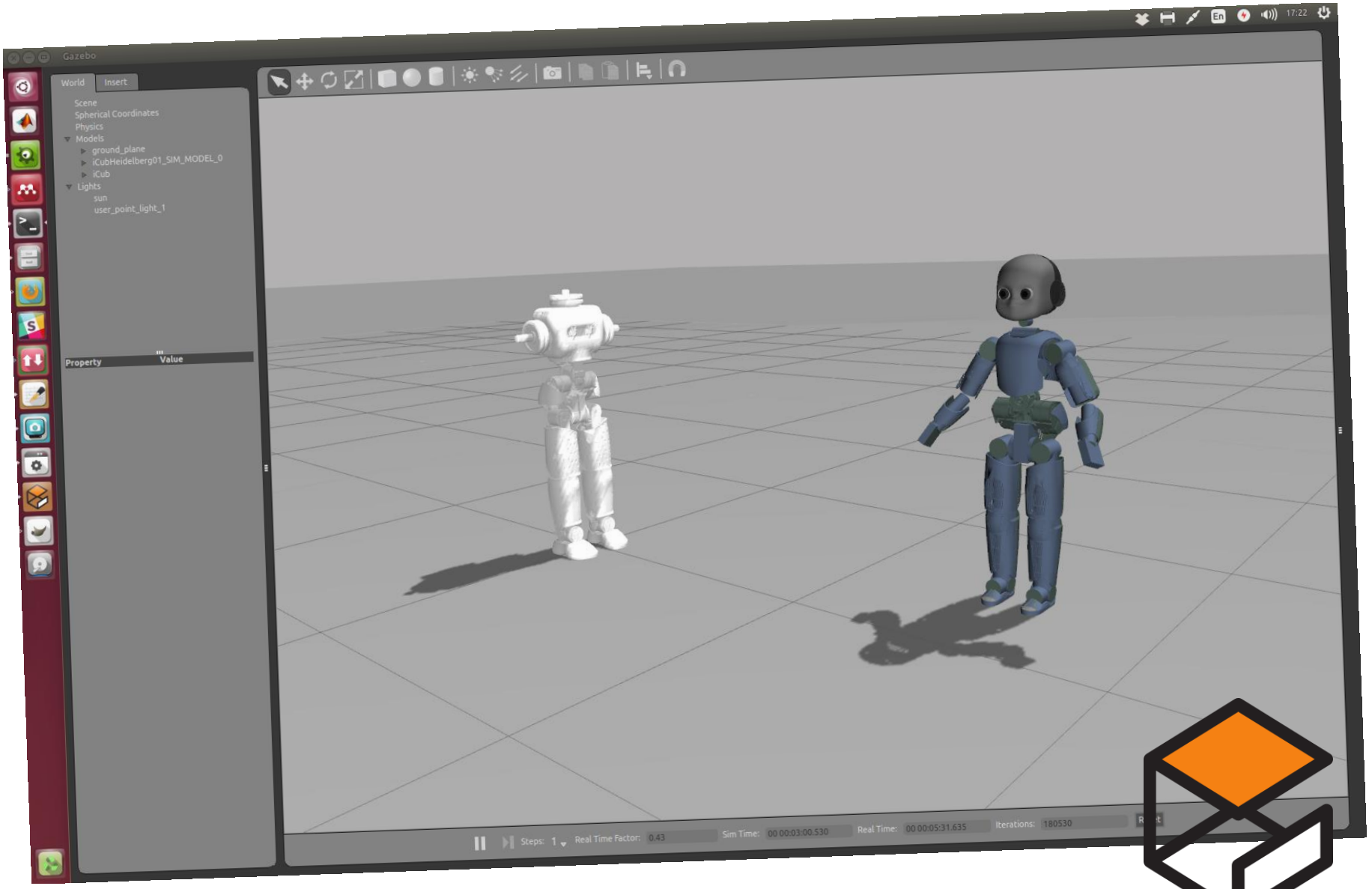
Motor position (14bit)

Joint position (15bit)

6-axis Force/Torque (shoulder)



documentation at:
http://wiki.icub.org/wiki/ICub_mechanics_CAD


Gazebo
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Scene
Spherical Coordinates
Physics
Models
ground_plane
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iCub
Lights
sun
user_point_light_1
Property
Value
Steps:
Real Time Factor:
Sim Time:
Real Time:
Iterations:
GAZEBO

iCub.org

an open source cognitive humanoid robotic platform

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iCub appears on the @SPARCrobotics website under the heading of "success stories"

iit istituto italiano di tecnologia

funded by the EU Commission under the Cognitive Systems and Robotics program

The iCub is the humanoid robot developed at IIT as part of the EU project RobotCub and subsequently adopted by more than 20 laboratories worldwide. It has 53 motors that move the head, arms & hands, waist, and legs. It can see and hear, it has the sense of proprioception (body configuration) and movement (using accelerometers and gyroscopes). We are working to improve on this in order to give the iCub the sense of touch and to grade how much force it exerts on the environment.

THANK YOU FOR THE ATTENTION

QUESTIONS?