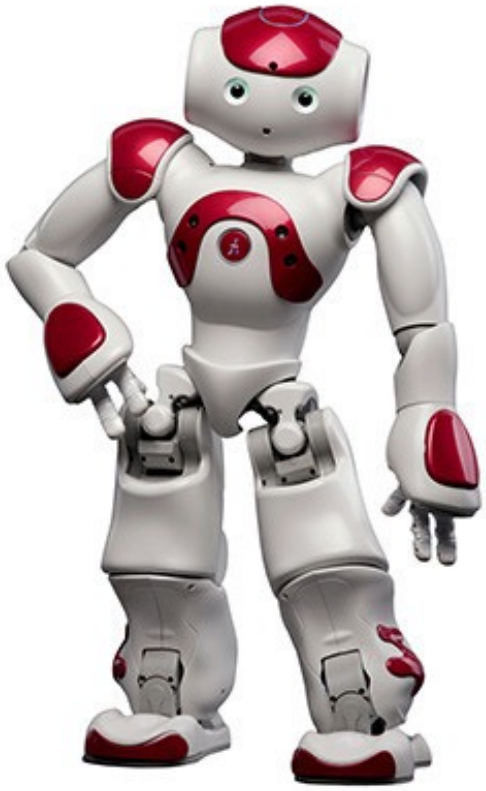
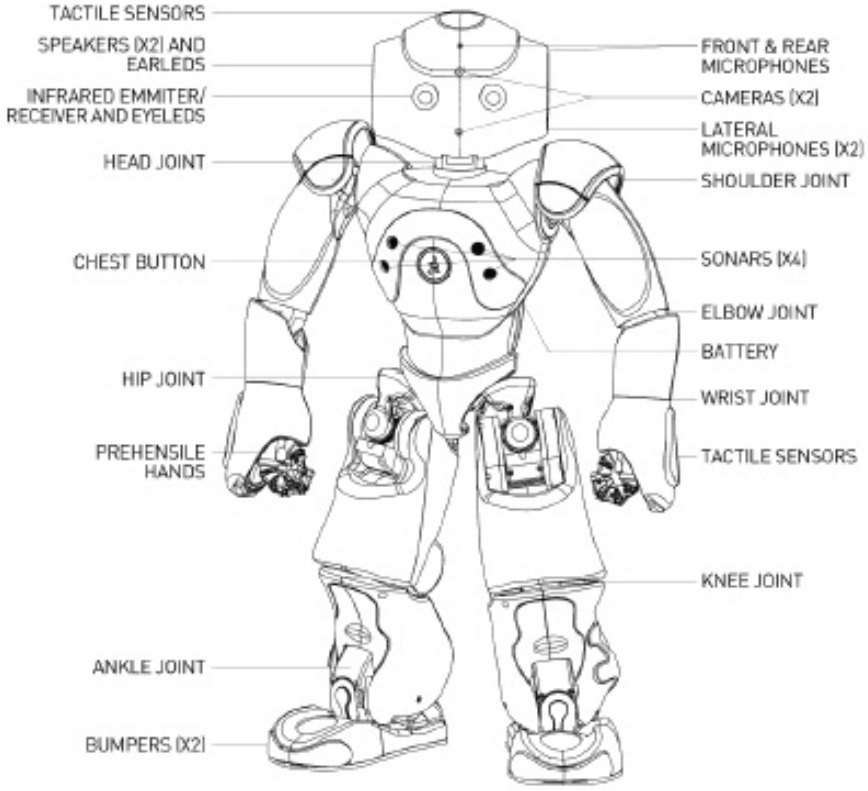
NAO

Programmare un robot umanoide

Nao: come è fatto?

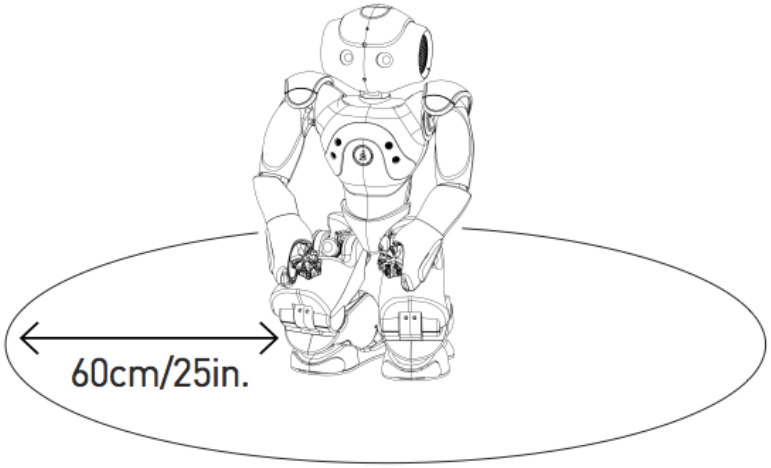




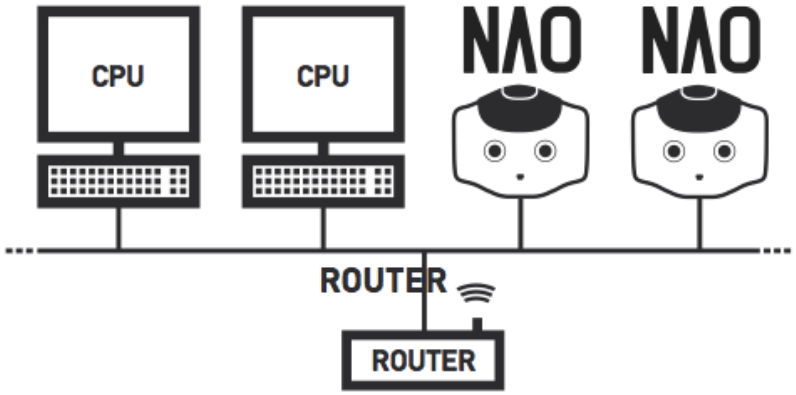
ALDEBARAN Robotics

Posizionamento e connessione

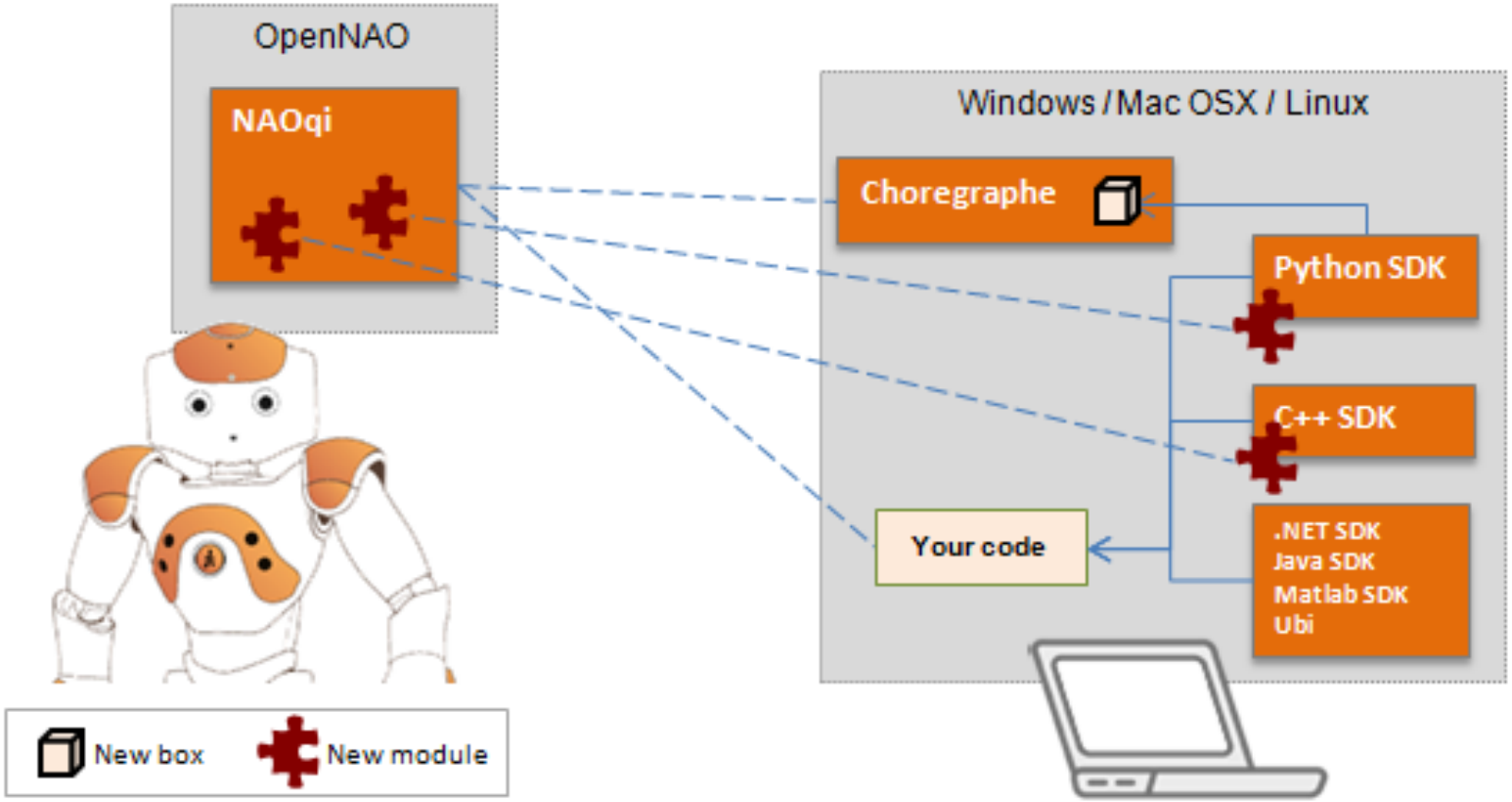
- Assicurarsi che ci sia sufficiente spazio intorno al robot. Posizionarlo preferibilmente sul pavimento.



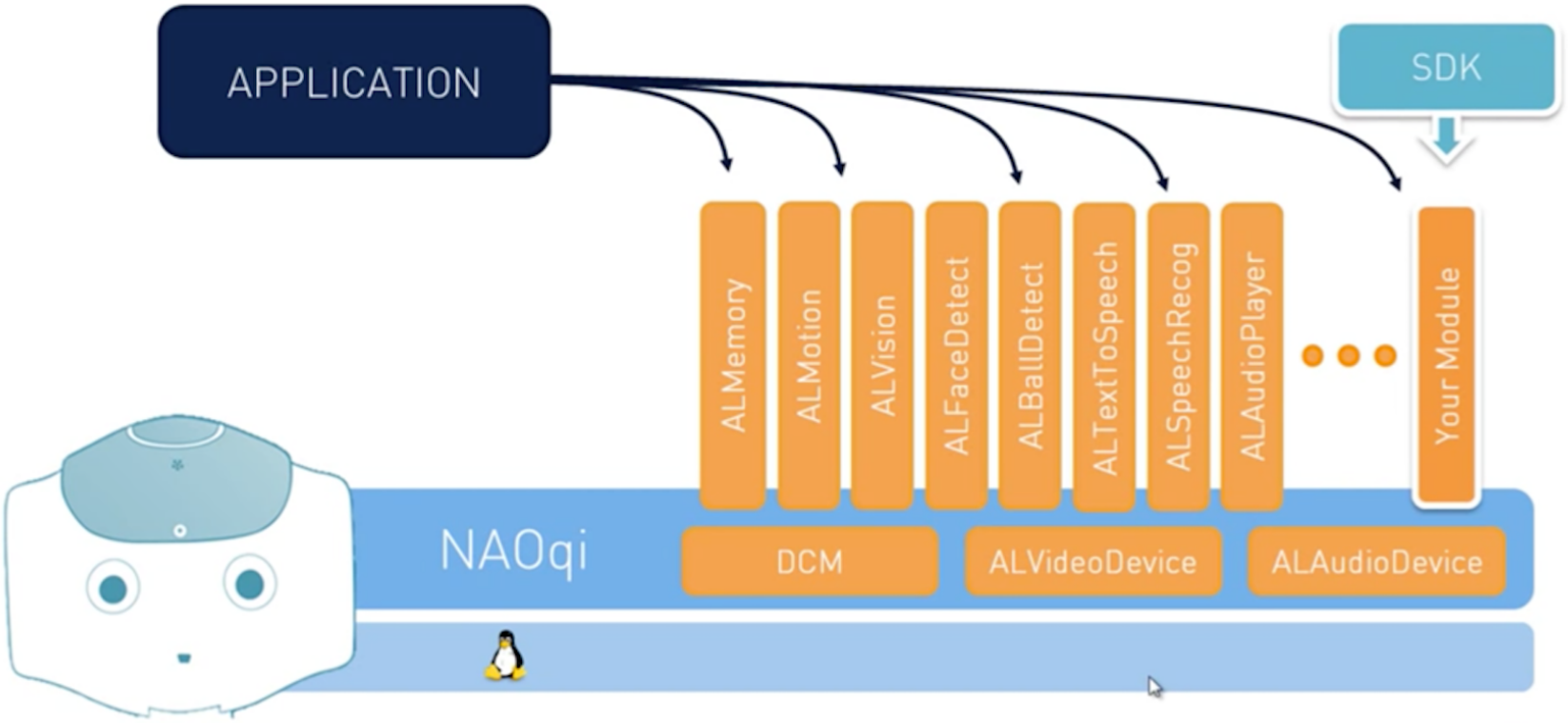
- Assicurarsi che NAO sia connesso alla rete (ethernet o WiFi)



NAO: come funziona?



Perchè programmare in Python

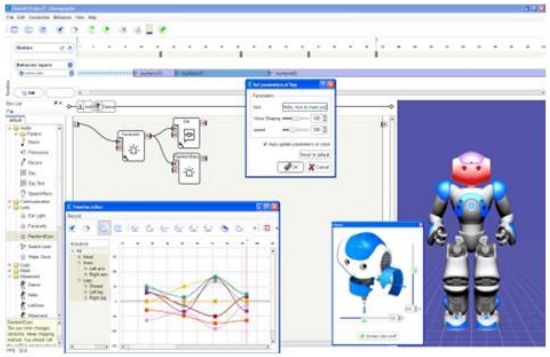


Controllo da remoto

RUNS ON THE COMPUTER

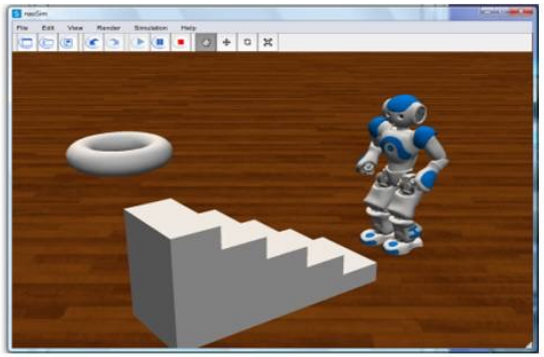
- Sends orders (move, talk, ...)
- Asks for data (image, distance, ...)

Software Suite



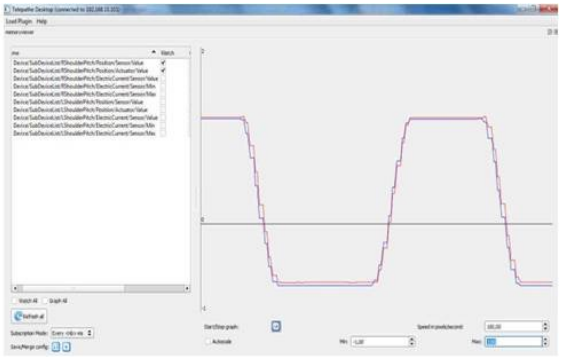
Choregraphe

- ✓ Graphical Development of Behaviors
- ✓ Ergonomic and user-friendly Interface



NAOsim

- ✓ Physical Simulation Engine
- ✓ Behaviors Simulation and validation



Monitor

- ✓ Ergonomic Interface to monitor actuators and sensors data

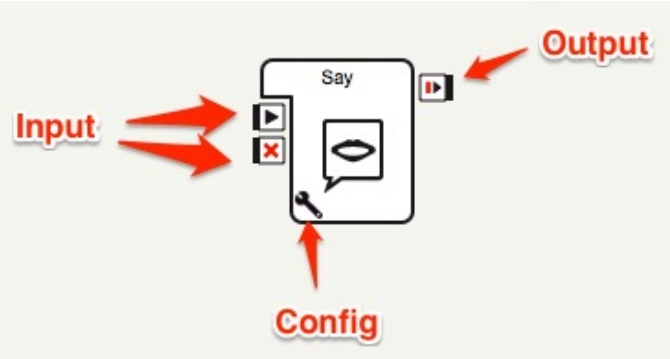
SDK

- ✓ Compilation and debugging tools
- ✓ MatLab, Java, Python, C++, .NET, MS Robotics Studio

Choreographe

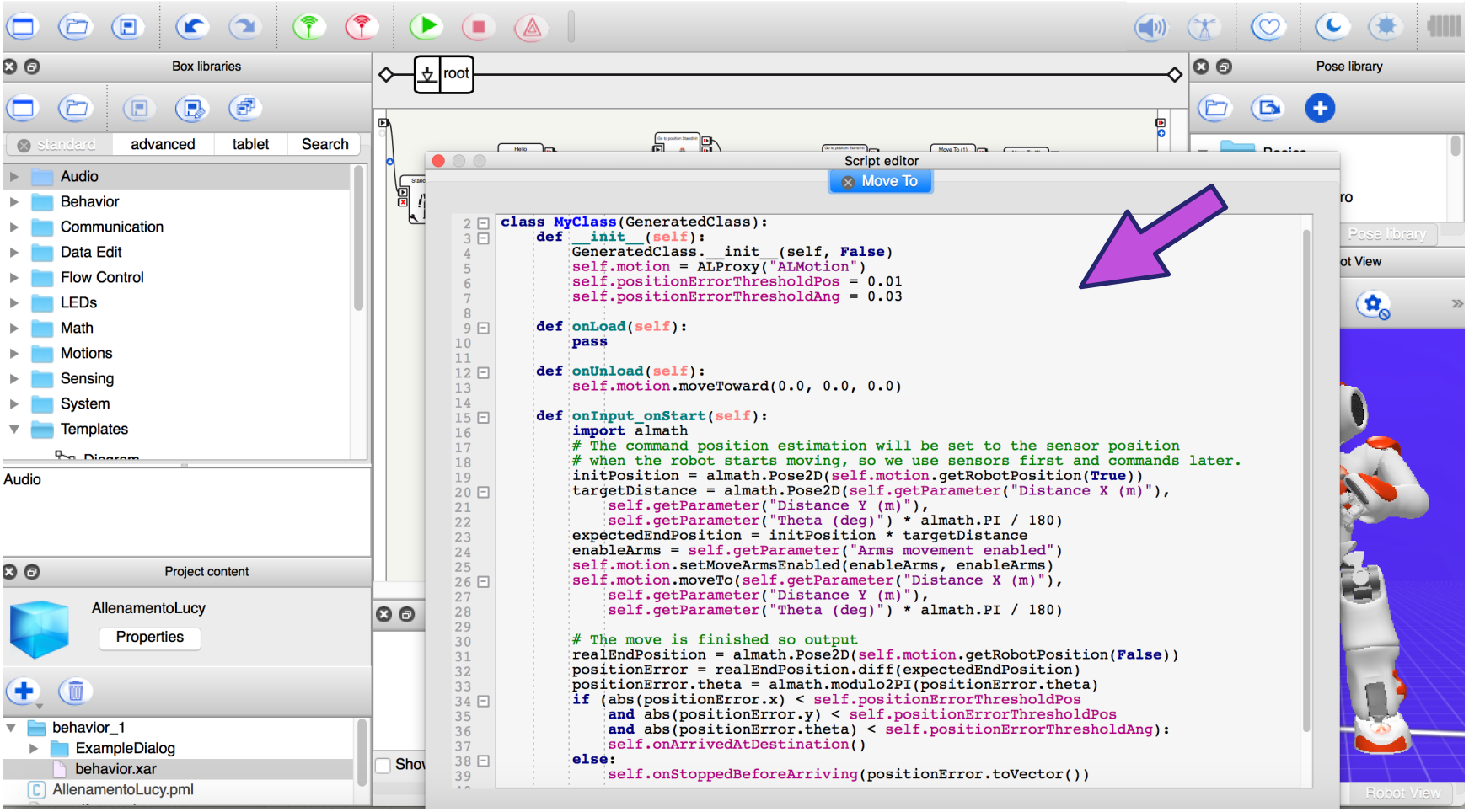
- E' un'interfaccia grafica per la programmazione di NAO (disponibile per Windows, Mac e Linux)
  (scaricabile creando un account gratuito su **Aldebaran community**)

- E' composto da box che contengono codice per azioni specifiche



- Codice Python nei box
- Un box può essere composto da più box
- Un box può avere più inputs/outputs

Python Box

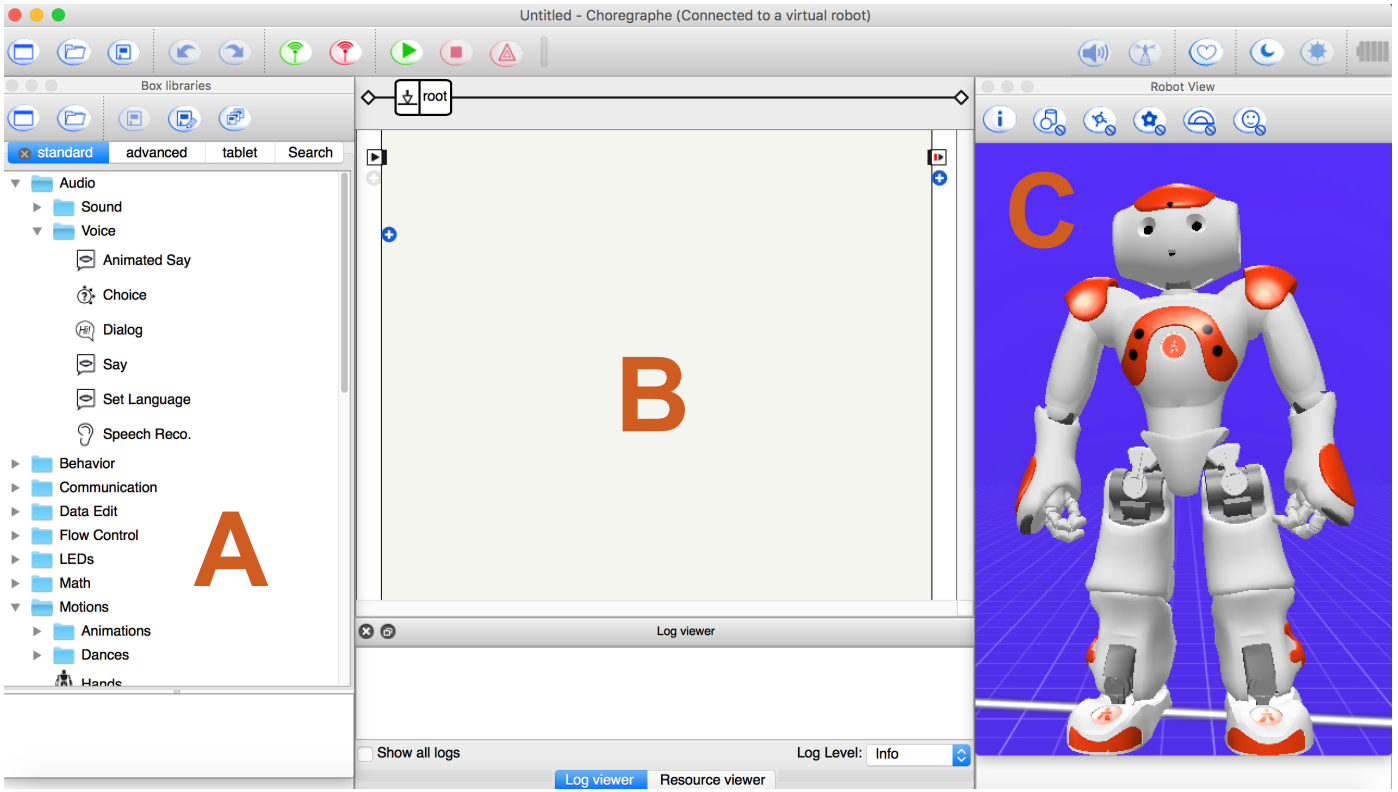

Box libraries
root
Pose library
Script editor
Move To
Audio
Behavior
Communication
Data Edit
Flow Control
LEDs
Math
Motions
Sensing
System
Templates
Project content
AllenamentoLucy
Properties
behavior_1
ExampleDialog
behavior.xar
AllenamentoLucy.pml
class MyClass(GeneratedClass):
def __init__(self):
GeneratedClass.__init__(self, False)
self.motion = ALProxy("ALMotion")
self.positionErrorThresholdPos = 0.01
self.positionErrorThresholdAng = 0.03
def onLoad(self):
pass
def onUnload(self):
self.motion.moveToward(0.0, 0.0, 0.0)
def onInput_onStart(self):
import almath
# The command position estimation will be set to the sensor position
# when the robot starts moving, so we use sensors first and commands later.
initPosition = almath.Pose2D(self.motion.getRobotPosition(True))
targetDistance = almath.Pose2D(self.getParameter("Distance X (m)"),
self.getParameter("Distance Y (m)"),
self.getParameter("Theta (deg)") * almath.PI / 180)
expectedEndPosition = initPosition * targetDistance
enableArms = self.getParameter("Arms movement enabled")
self.motion.setMoveArmsEnabled(enableArms, enableArms)
self.motion.moveTo(self.getParameter("Distance X (m)"),
self.getParameter("Distance Y (m)"),
self.getParameter("Theta (deg)") * almath.PI / 180)
# The move is finished so output
realEndPosition = almath.Pose2D(self.motion.getRobotPosition(False))
positionError = realEndPosition.diff(expectedEndPosition)
positionError.theta = almath.modulo2PI(positionError.theta)
if (abs(positionError.x) < self.positionErrorThresholdPos
and abs(positionError.y) < self.positionErrorThresholdPos
and abs(positionError.theta) < self.positionErrorThresholdAng):
self.onArrivedAtDestination()
else:
self.onStoppedBeforeArriving(positionError.toVector())
Robot View

Choreographe - Panelli

A Box libraries panel

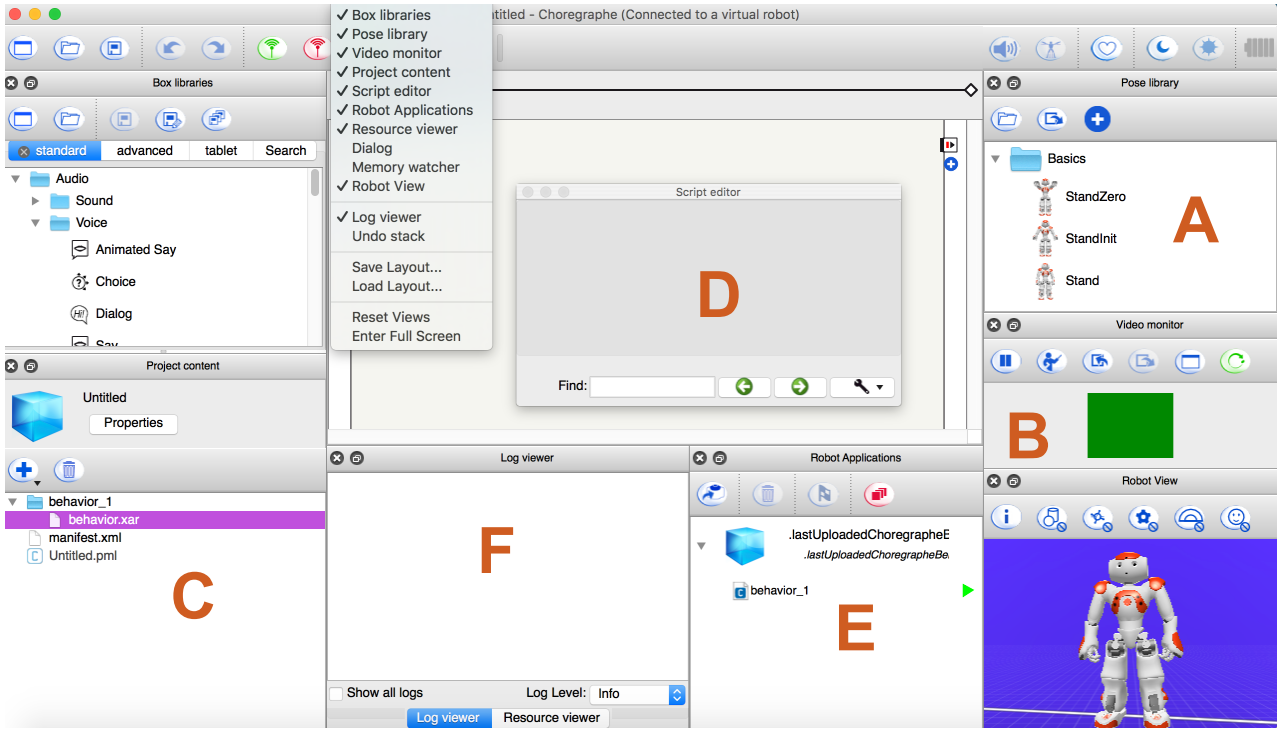
B Flow diagram panel

C 3D Robot View

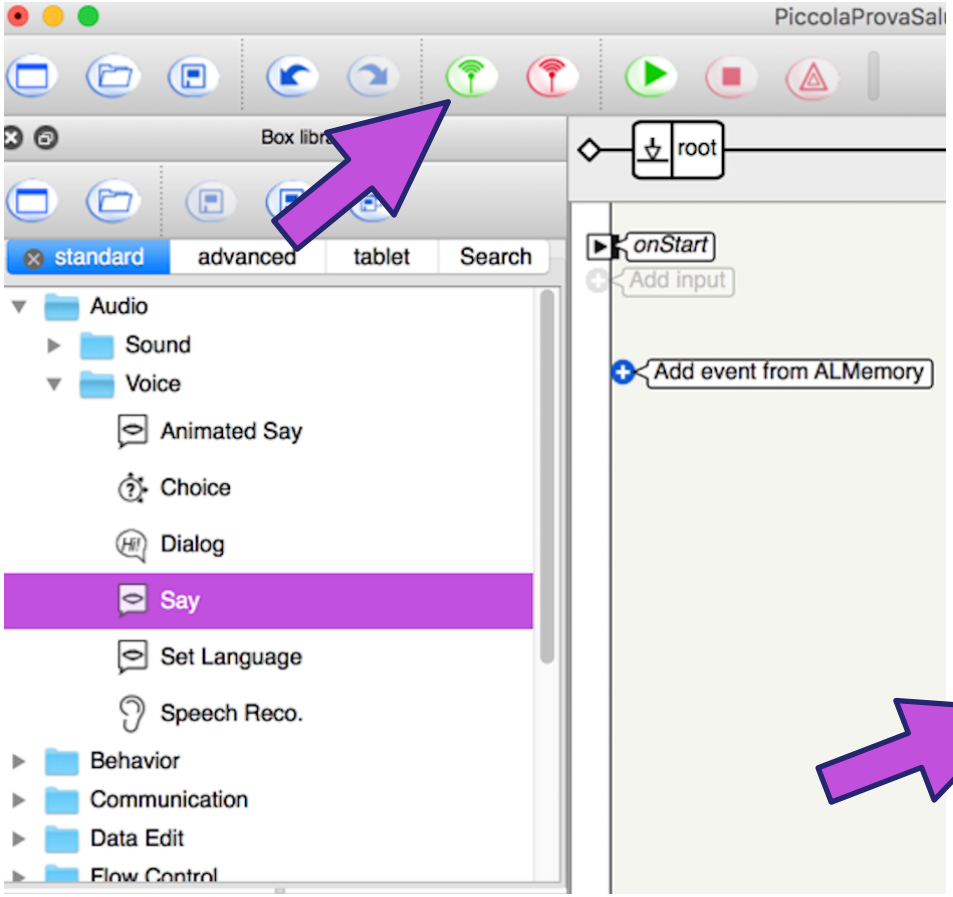


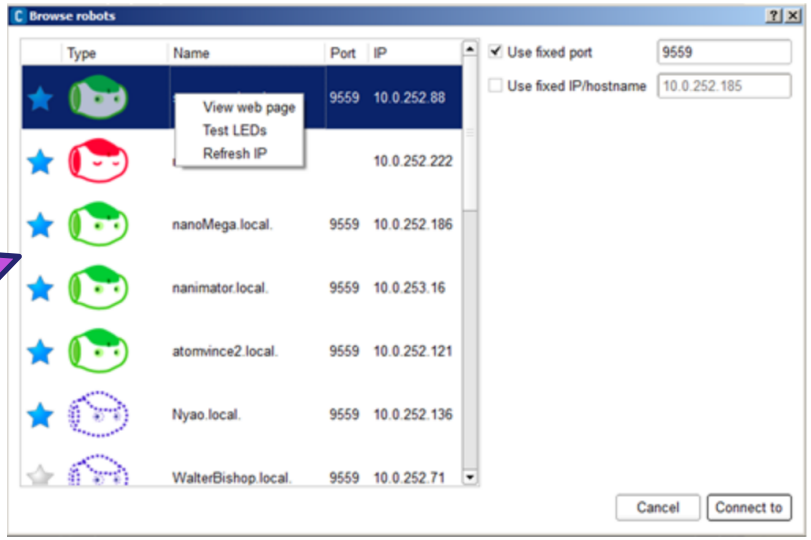
Choreographe - Panelli

A Pose library panel
B Video monitor panel
C Resource viewer panel
D Script editor panel
E Robot applications
F Log viewer

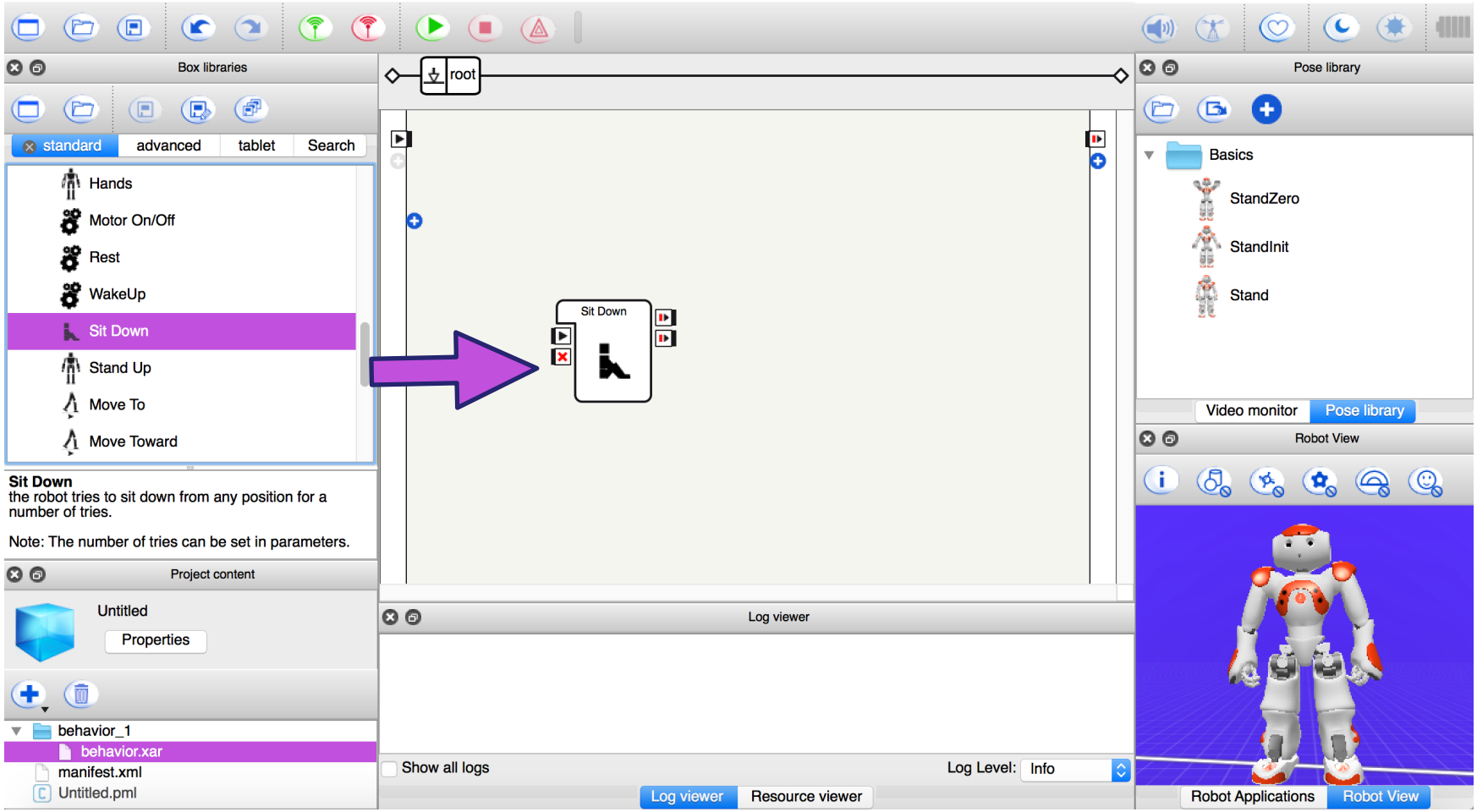


Demo - step 1

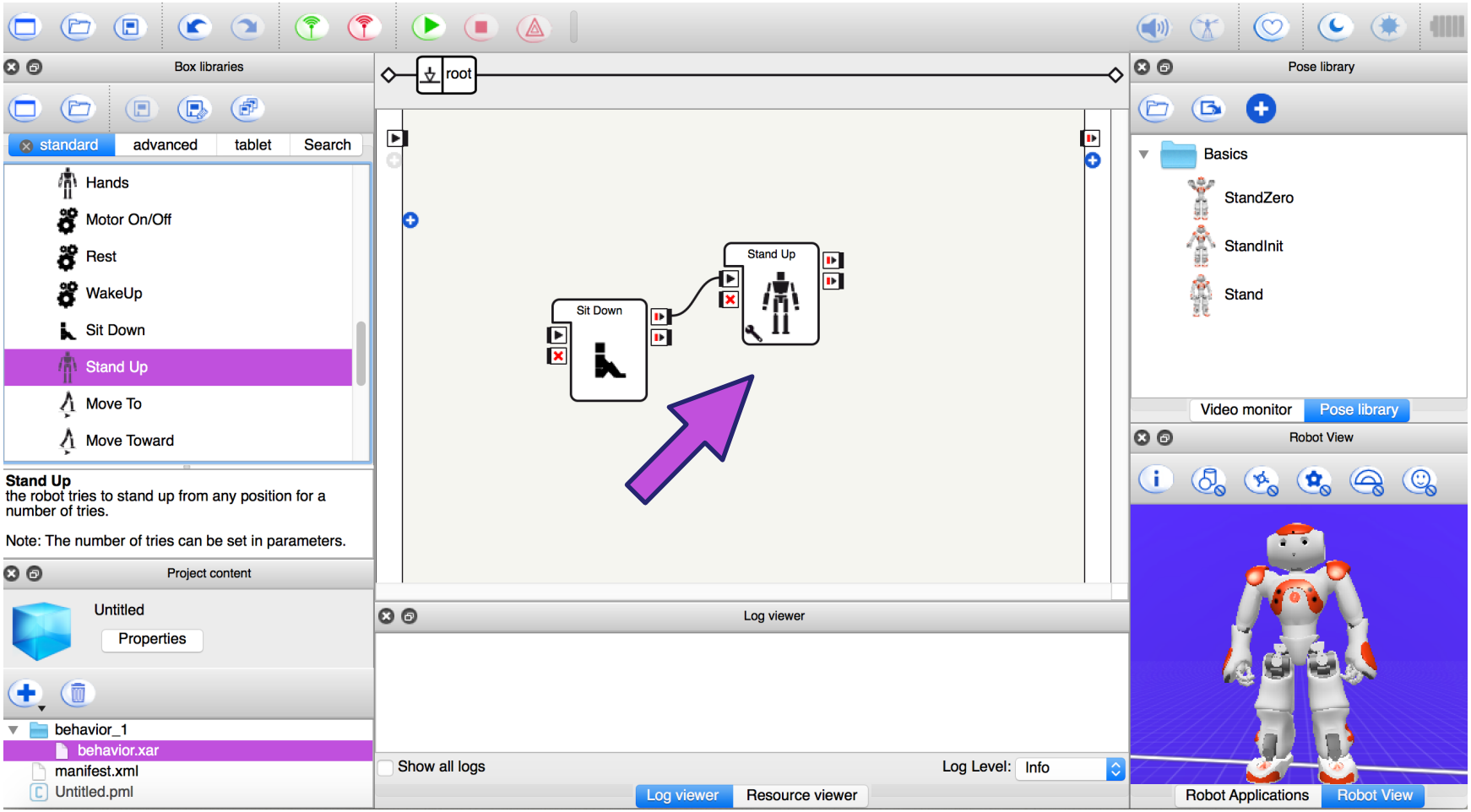

PiccolaProvaSal
Box libra
root
standard
advanced
tablet
Search
Audio
Sound
Voice
Animated Say
Choice
Dialog
Say
Set Language
Speech Reco.
Behavior
Communication
Data Edit
Flow Control
onStart
Add input
Add event from ALMemory


Browse robots
Type
Name
Port
IP
Use fixed port
9559
Use fixed IP/hostname
10.0.252.185
View web page
Test LEDs
Refresh IP
9559 10.0.252.88
10.0.252.222
nanoMega.local. 9559 10.0.252.186
nanimator.local. 9559 10.0.253.16
atomvince2.local. 9559 10.0.252.121
Nyao.local. 9559 10.0.252.136
WalterBishop.local. 9559 10.0.252.71
Cancel
Connect to

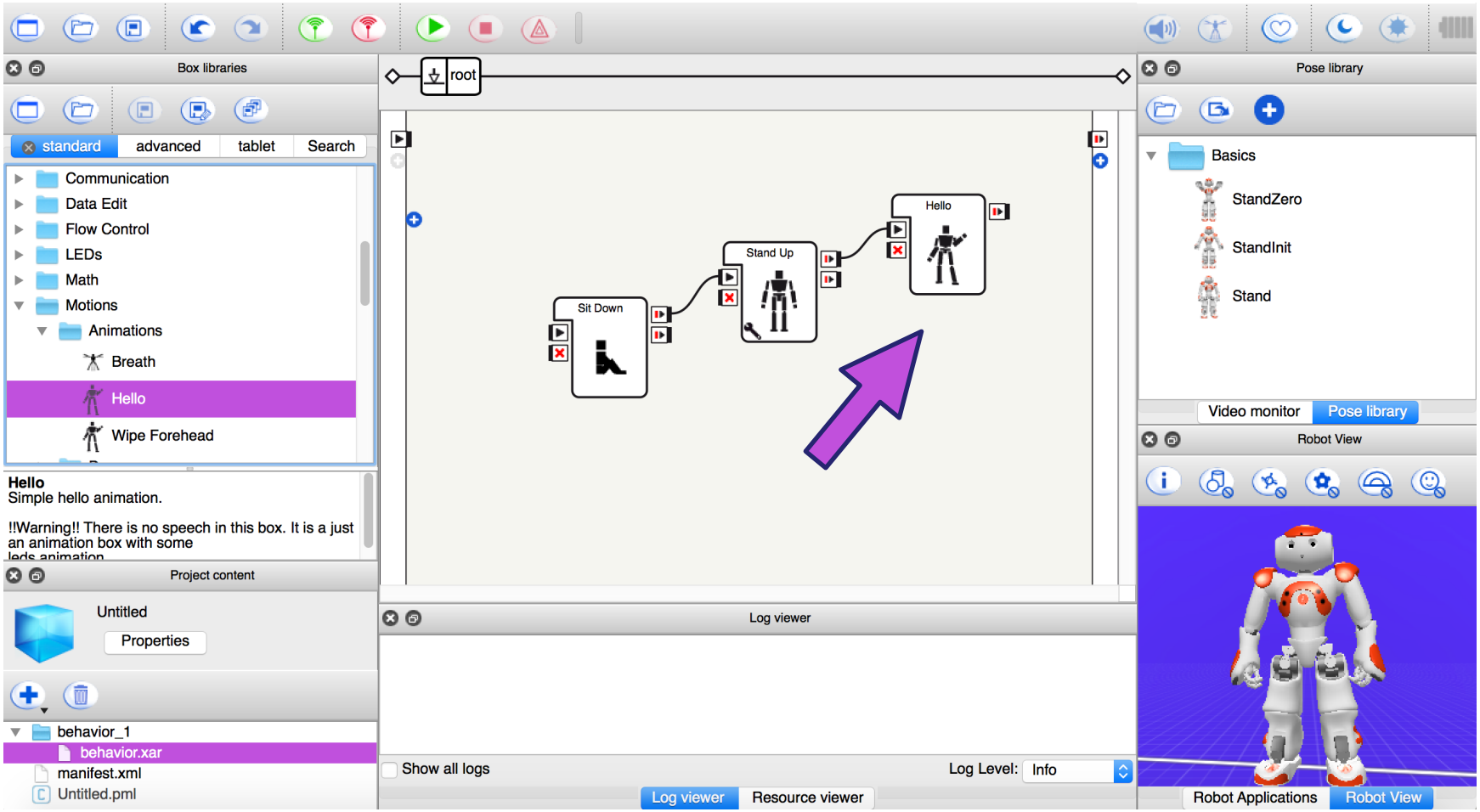
Demo - step 2


Box libraries
standard
advanced
tablet
Search
Hands
Motor On/Off
Rest
WakeUp
Sit Down
Stand Up
Move To
Move Toward
Sit Down
the robot tries to sit down from any position for a number of tries.
Note: The number of tries can be set in parameters.
Project content
Untitled
Properties
behavior_1
behavior.xar
manifest.xml
Untitled.pml
root
Sit Down
Log viewer
Show all logs
Log Level: Info
Log viewer
Resource viewer
Pose library
Basics
StandZero
StandInit
Stand
Video monitor
Pose library
Robot View
Robot Applications
Robot View

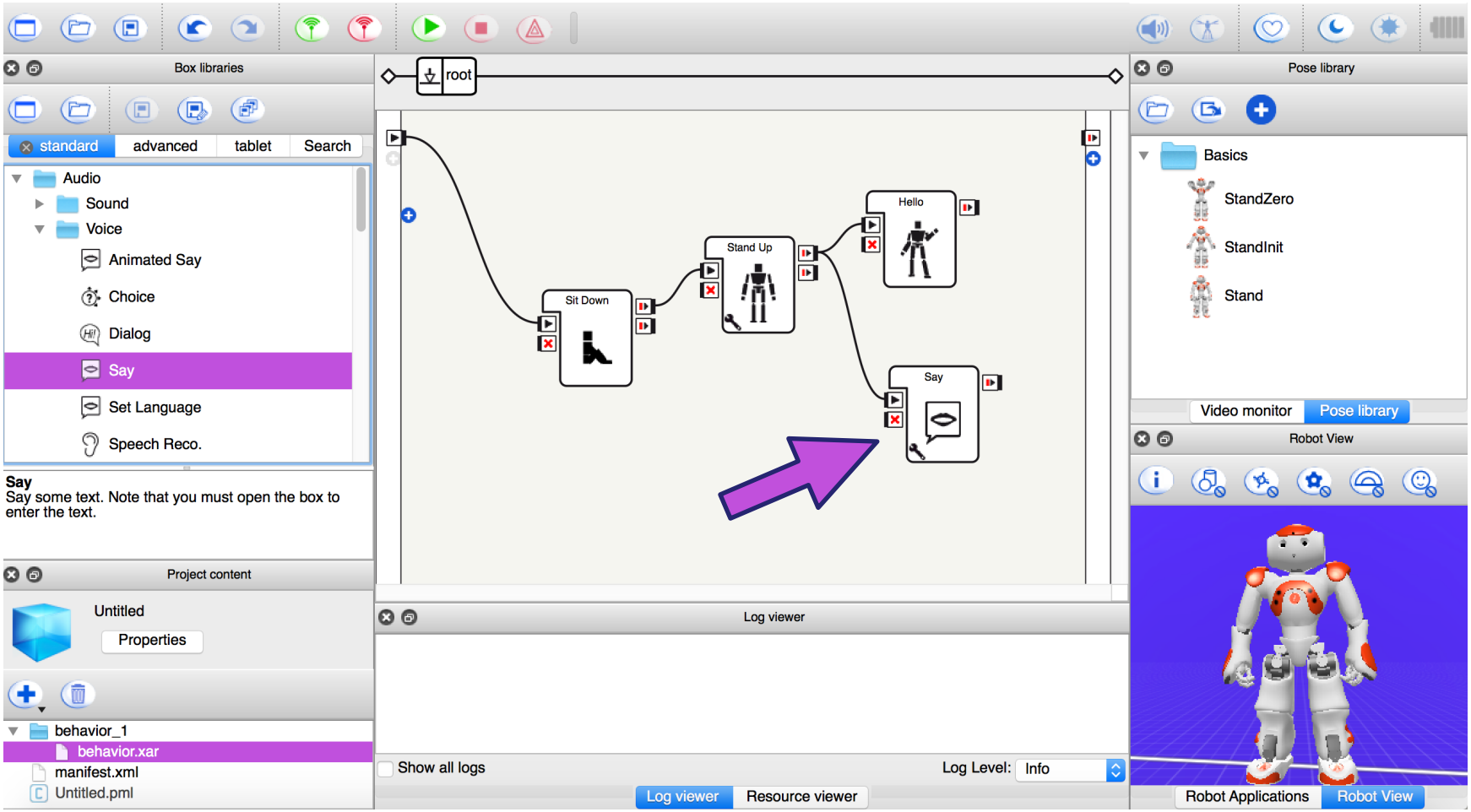
Demo - step 3


Box libraries
standard
advanced
tablet
Search
Hands
Motor On/Off
Rest
WakeUp
Sit Down
Stand Up
Move To
Move Toward
Stand Up
the robot tries to stand up from any position for a number of tries.
Note: The number of tries can be set in parameters.
Project content
Untitled
Properties
behavior_1
behavior.xar
manifest.xml
Untitled.pml
root
Sit Down
Stand Up
Log viewer
Show all logs
Log Level:
Info
Log viewer
Resource viewer
Pose library
Basics
StandZero
StandInit
Stand
Video monitor
Pose library
Robot View
Robot Applications
Robot View

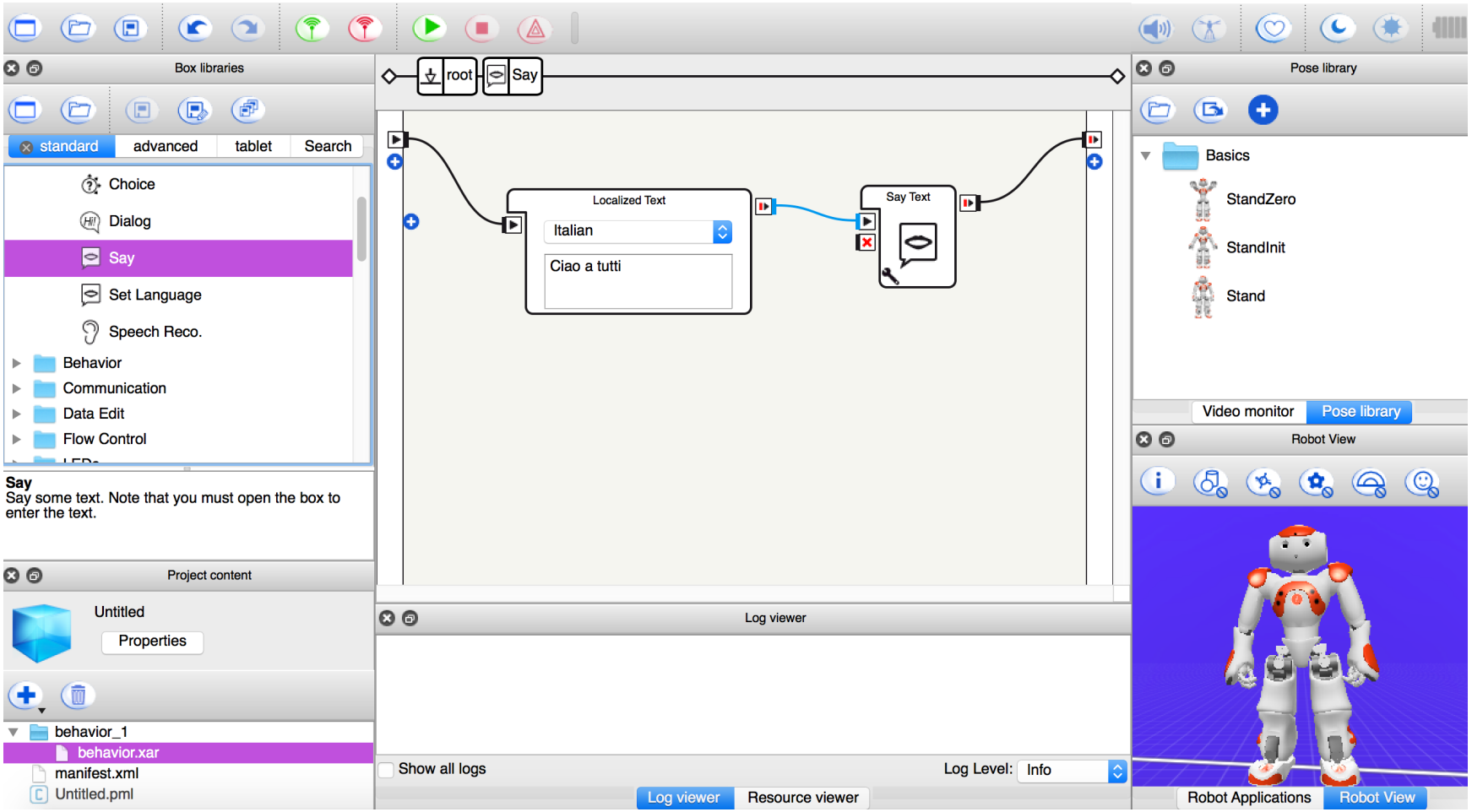
Demo - step 4


Box libraries
standard
advanced
tablet
Search
Communication
Data Edit
Flow Control
LEDs
Math
Motions
Animations
Breath
Hello
Wipe Forehead
Hello
Simple hello animation.
!!Warning!! There is no speech in this box. It is a just an animation box with some
Project content
Untitled
Properties
behavior_1
behavior.xar
manifest.xml
Untitled.pml
root
Sit Down
Stand Up
Hello
Log viewer
Show all logs
Log Level:
Info
Log viewer
Resource viewer
Pose library
Basics
StandZero
StandInit
Stand
Video monitor
Pose library
Robot View
Robot Applications
Robot View

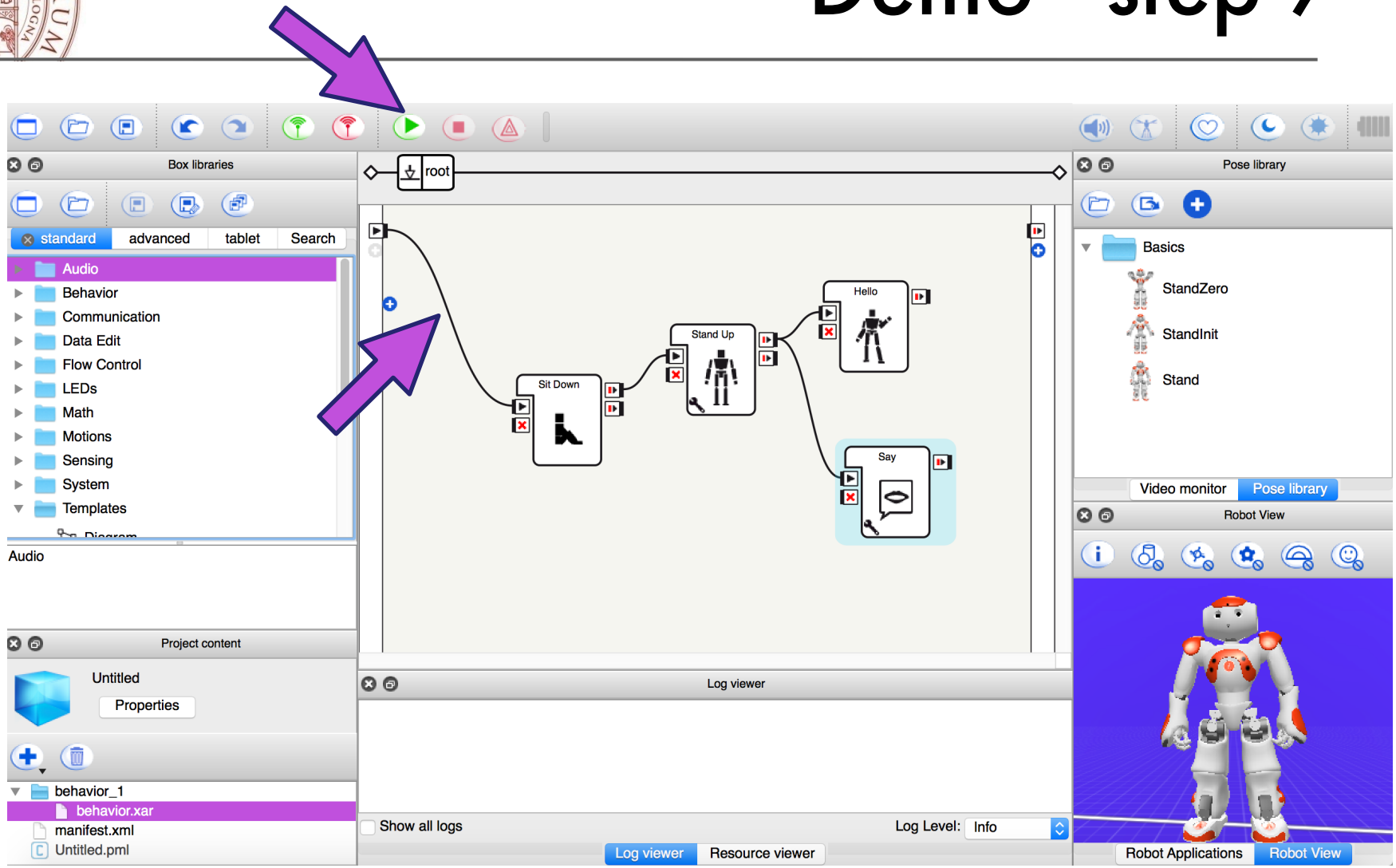
Demo - step 5


Box libraries
standard
advanced
tablet
Search
Audio
Sound
Voice
Animated Say
Choice
Dialog
Say
Set Language
Speech Reco.
Say
Say some text. Note that you must open the box to enter the text.
Project content
Untitled
Properties
behavior_1
behavior.xar
manifest.xml
Untitled.pml
root
Sit Down
Stand Up
Hello
Say
Log viewer
Show all logs
Log Level:
Info
Log viewer
Resource viewer
Pose library
Basics
StandZero
StandInit
Stand
Video monitor
Pose library
Robot View
Robot Applications
Robot View

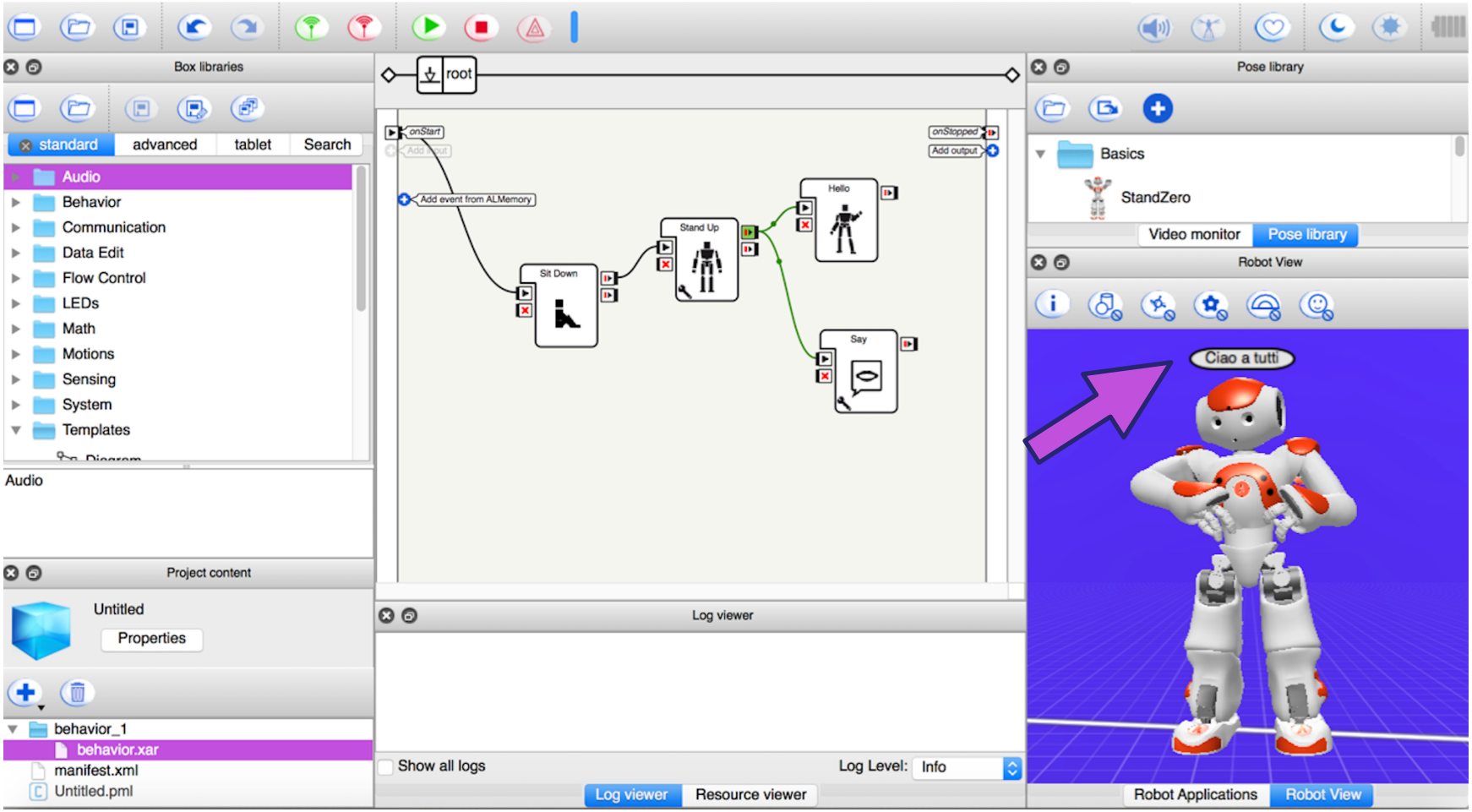
Demo - step 6


Box libraries
standard
advanced
tablet
Search
Choice
Dialog
Say
Set Language
Speech Reco.
Behavior
Communication
Data Edit
Flow Control
Say
Say some text. Note that you must open the box to enter the text.
Project content
Untitled
Properties
behavior_1
behavior.xar
manifest.xml
Untitled.pml
root
Say
Localized Text
Italian
Ciao a tutti
Say Text
Log viewer
Show all logs
Log Level:
Info
Log viewer
Resource viewer
Pose library
Basics
StandZero
StandInit
Stand
Video monitor
Pose library
Robot View
Robot Applications
Robot View

Demo - step 7


Box libraries
standard
advanced
tablet
Search
Audio
Behavior
Communication
Data Edit
Flow Control
LEDs
Math
Motions
Sensing
System
Templates
Audio
Project content
Untitled
Properties
behavior_1
behavior.xar
manifest.xml
Untitled.pml
root
Sit Down
Stand Up
Hello
Say
Log viewer
Show all logs
Log Level:
Info
Log viewer
Resource viewer
Pose library
Basics
StandZero
StandInit
Stand
Video monitor
Pose library
Robot View
Robot Applications
Robot View

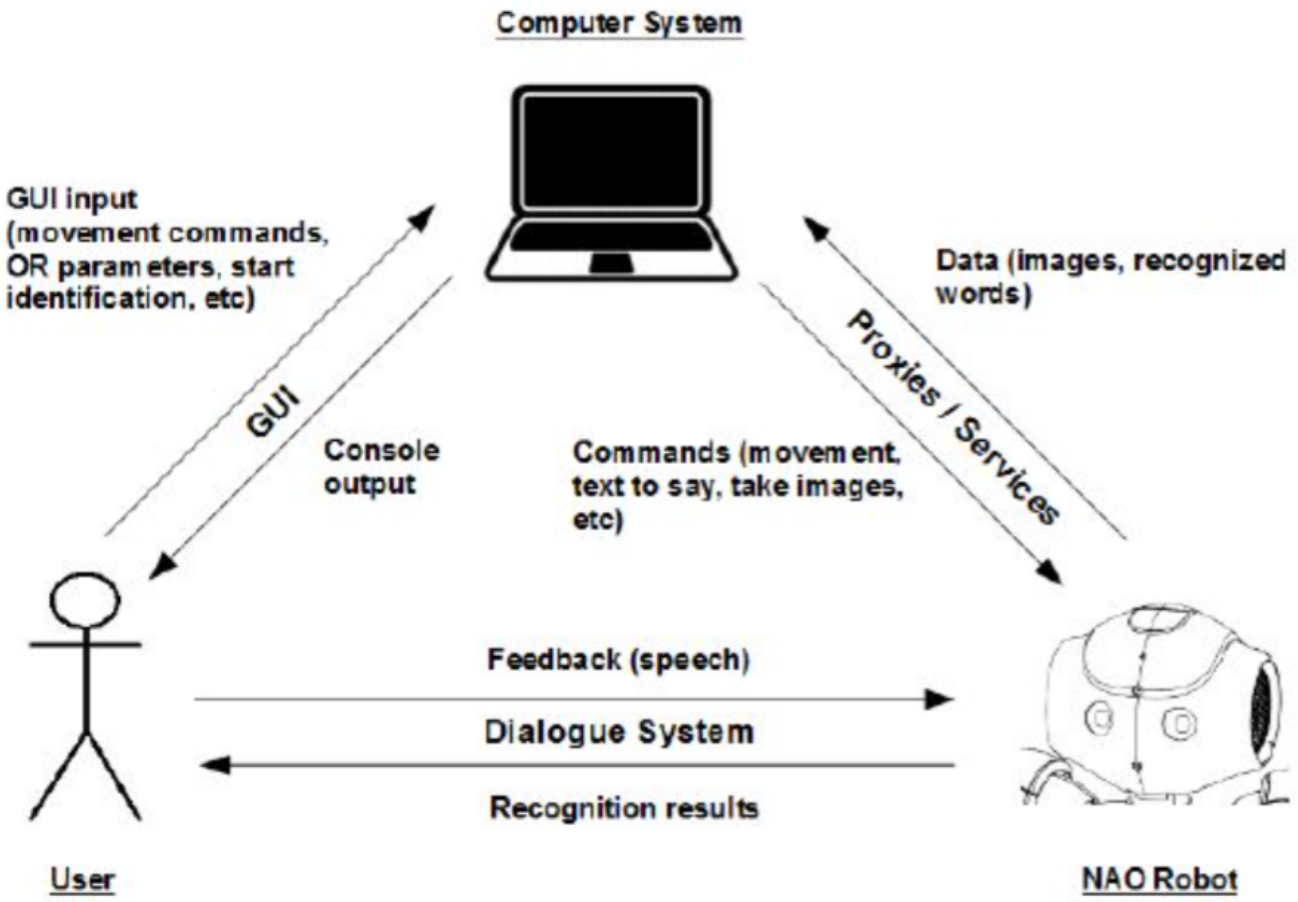
Demo - step 8


Box libraries
standard
advanced
tablet
Search
Audio
Behavior
Communication
Data Edit
Flow Control
LEDs
Math
Motions
Sensing
System
Templates
Audio
root
onStart
Add event from ALMemory
Sit Down
Stand Up
Hello
Say
onStopped
Add output
Pose library
Basics
StandZero
Video monitor
Pose library
Robot View
Ciao a tutti
Project content
Untitled
Properties
behavior_1
behavior.xar
manifest.xml
Untitled.pml
Log viewer
Show all logs
Log Level:
Info
Log viewer
Resource viewer
Robot Applications
Robot View

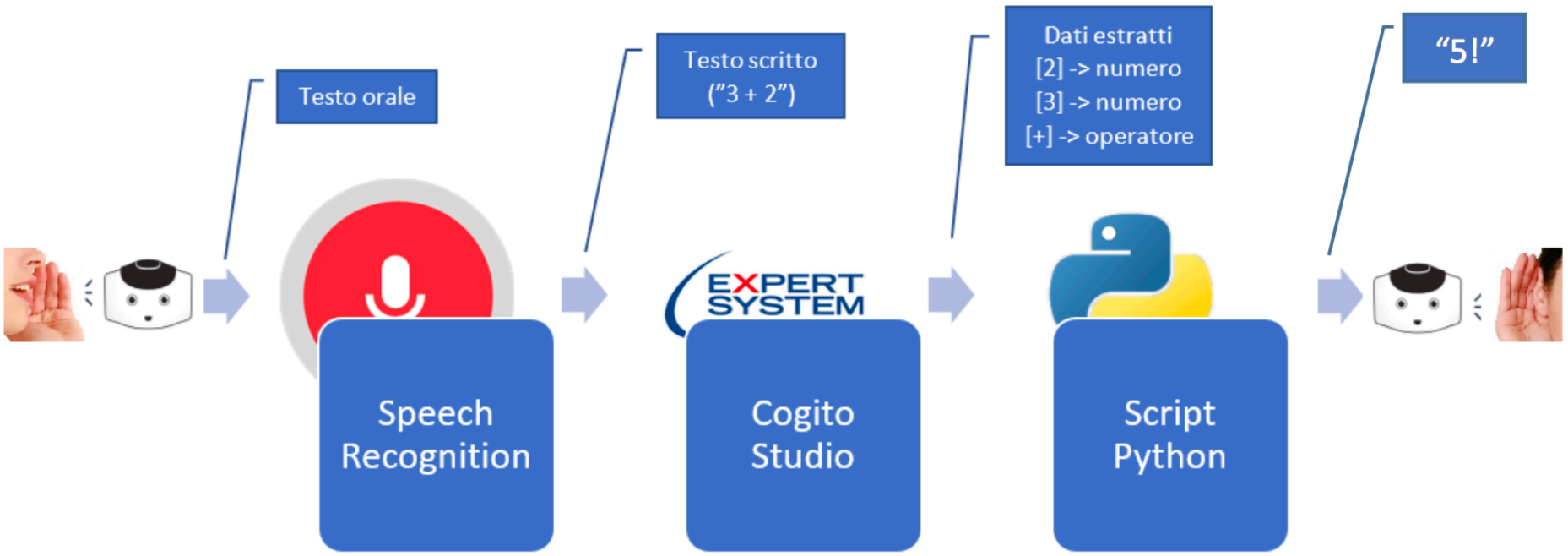
Progetti e tesi svolti

1. NAO gioca a calcio (**RoboCup**)
2. **Tesi e progetti**
   - ☑ NAO gioca a “Indovina chi”
   - ☑ Planning per azioni NAO e apprendimento di nuovi movimenti in Timeline
   - ☑ NAO si muove in una stanza
   - ☑ NAO matematico
3. **Tesi magistrali**
   - ☑ Reti neurali per
     - Riconoscimento facciale
     - OCR (Riconoscimento di caratteri)
   - ☑ Imitazione di movimenti umani tramite uso di Kinect

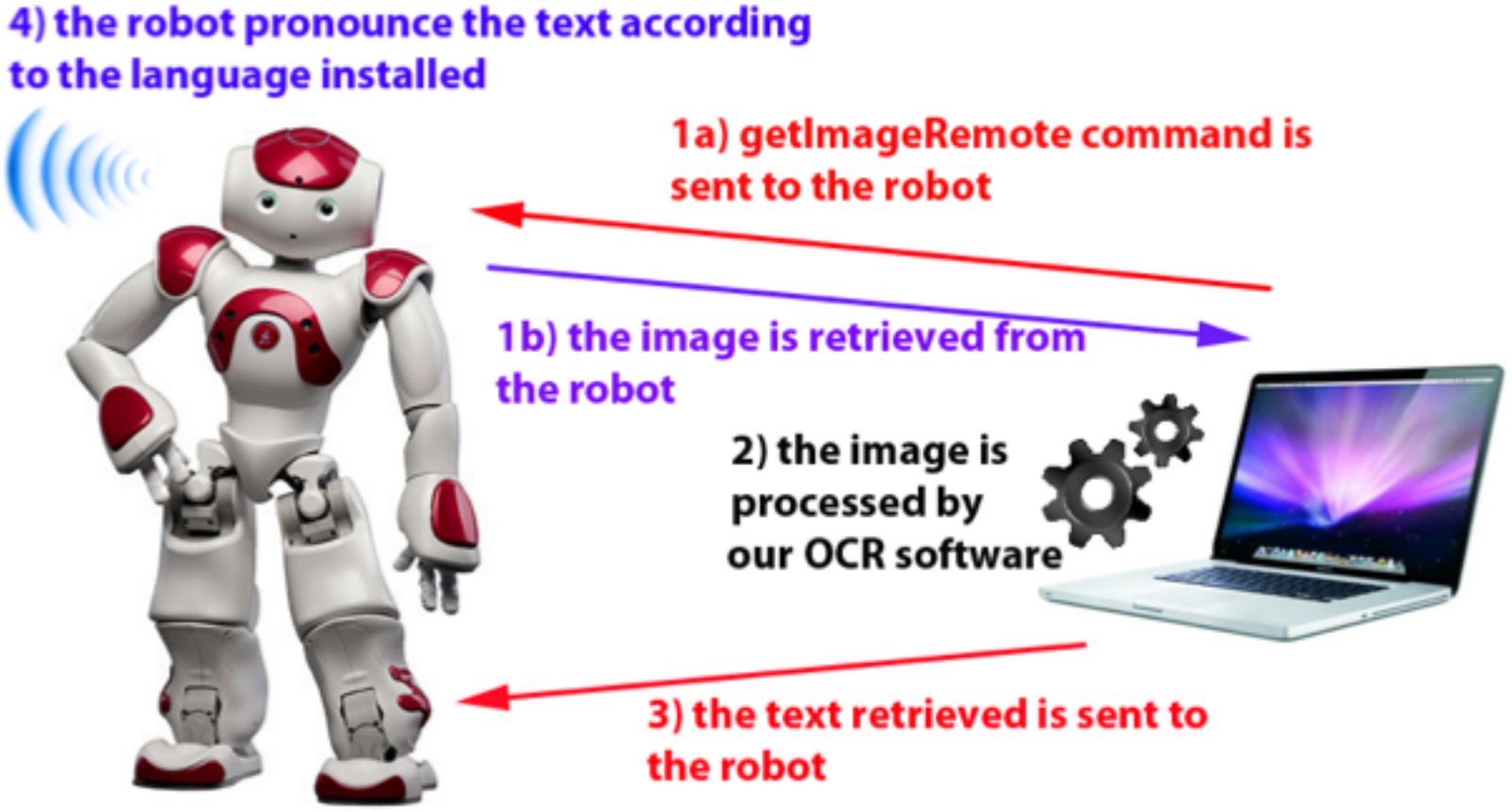
Riconoscimento facciale



NLP e matematica



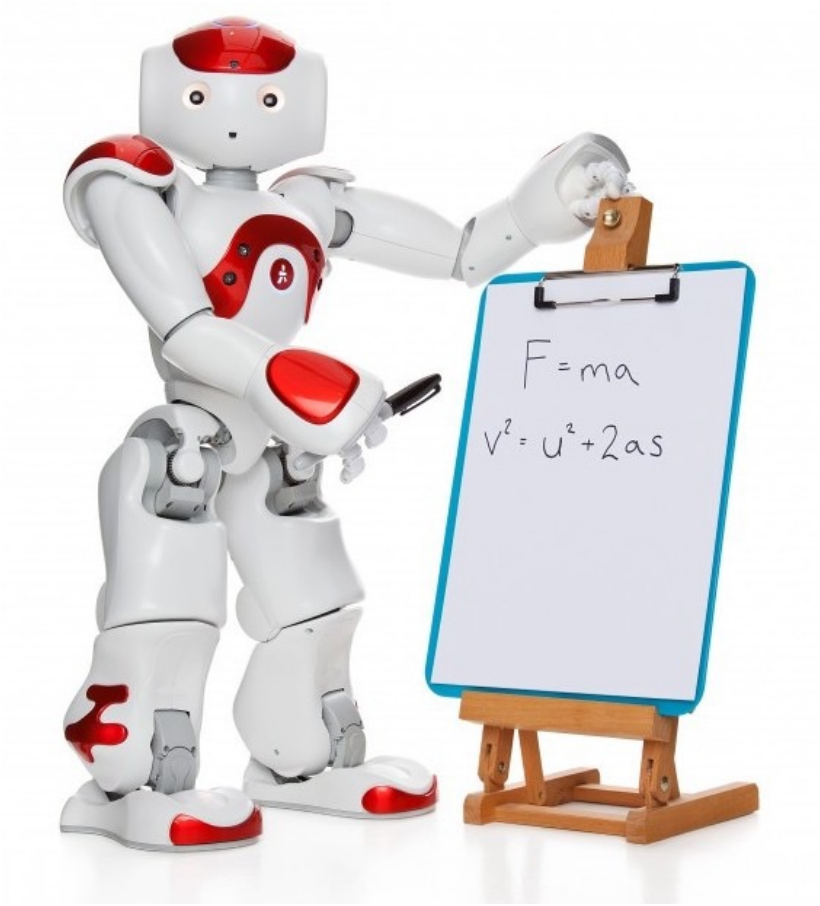
Lucy legge con OCR



Proposte di progetti e tesi

1. **NAO e linguaggio naturale**
   - ☑ Sviluppo di bot
   - ☑ Sviluppo di giochi interattivi
   - ☑ Sviluppo di abilità per quiz e giochi matematici
2. **NAO e planning real time**
   - ☑ Esecuzione di azioni (comandi) real-time in ambiente chiuso
   - ☑ Movimento all'interno di un percorso
3. **Sviluppo e ampliamento di progetti precedenti**

Presentiamo il nostro NAO: Lucy



Lasciamo che Lucy si presenti!

Grazie per l'attenzione!