

OpenHRP3 Course

How to use GrxUI

The screenshot displays the GrxUI interface for robot control. It features a 3D view of a robot in a virtual environment, a graph showing joint torques over time, and a table of robot state data.

Robot State Table:

No	Joint	Angle	Target	Current	PWR	SRY	Pgain	Dgain
0	R_HIP_Y	-1.0	---	---	---	---	---	---
1	R_HIP_R	-7.8	---	---	---	---	---	---
2	R_HIP_P	-44.4	---	---	---	---	---	---
3	R_KNEE_P	68.3	---	---	---	---	---	---
4	R_ANKLE_P	-31.3	---	---	---	---	---	---
5	R_ANKLE_R	7.9	---	---	---	---	---	---
6	L_HIP_Y	-0.0	---	---	---	---	---	---
7	L_HIP_R	-7.9	---	---	---	---	---	---
8	L_HIP_P	-22.1	---	---	---	---	---	---
9	L_KNEE_P	57.4	---	---	---	---	---	---
10	L_ANKLE_P	-34.8	---	---	---	---	---	---
11	L_ANKLE_R	7.7	---	---	---	---	---	---
12	R_SHOULDER_P	0.0	---	---	---	---	---	---
13	R_SHOULDER_R	-20.0	---	---	---	---	---	---
14	R_SHOULDER_Y	0.0	---	---	---	---	---	---
15	R_ELBOW_P	-40.0	---	---	---	---	---	---
16	L_SHOULDER_P	0.0	---	---	---	---	---	---
17	L_SHOULDER_R	20.0	---	---	---	---	---	---
18	L_SHOULDER_Y	-0.0	---	---	---	---	---	---
19	L_ELBOW_P	-40.0	---	---	---	---	---	---

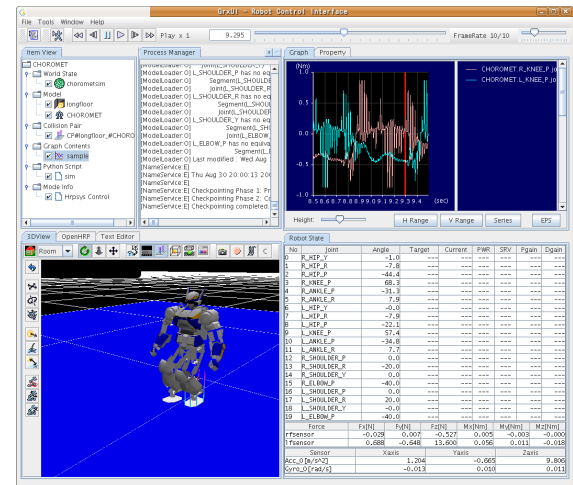
Force	Fx(N)	Fy(N)	Fz(N)	Mx(Nm)	My(Nm)	Mz(Nm)
rTsensord	-0.029	0.007	-0.527	0.005	-0.003	-0.000
lTsensord	0.688	-0.648	13.600	0.056	0.011	-0.018

Sensor	Xaxis	Yaxis	Zaxis
Acc_0 [m/s ²]	1.204	-0.665	9.806
Gyro_0 [rad/s]	-0.013	0.010	0.011

General Robotix, Inc

Contents

1. Overview on GrxUI
2. Sample Project Execution
3. Creating your own project
4. Other functions



1. Overview on GrxUI

Basic functions of OpenHRP3

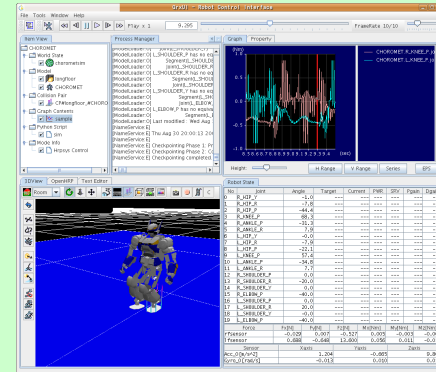
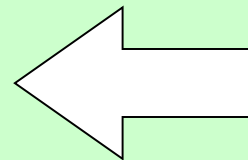
OpenHRP3

Model Loader

Collision Detector

Dynamics Simulator

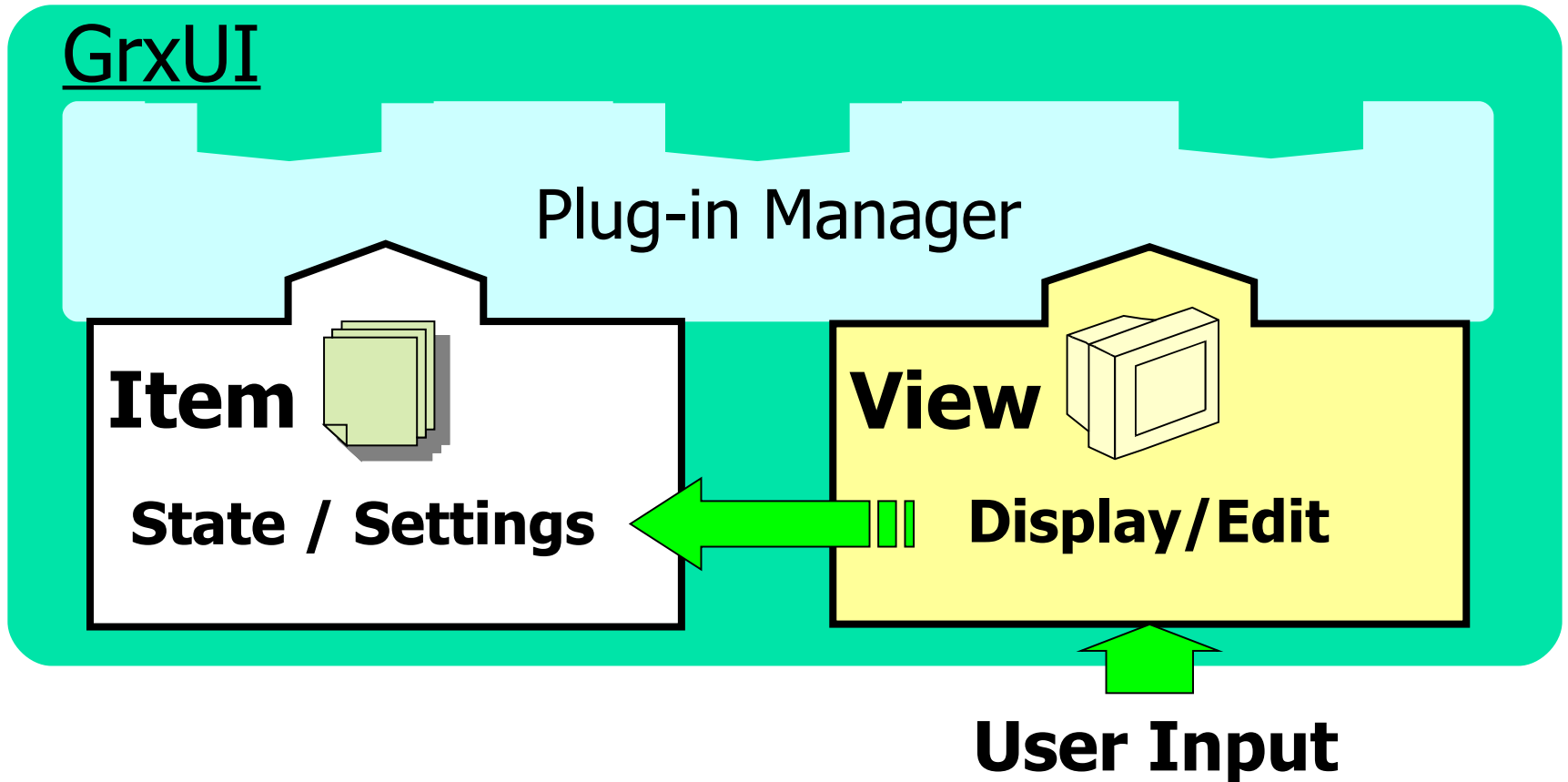
Robot Controller



- Start/Configure servers
- Scheduling
- Display results/Save

1. Overview on GrxUI

Plug-in extensions on functions



1. Overview on GrxUI

Example of Item



World State

World properties / Collision data log



Model

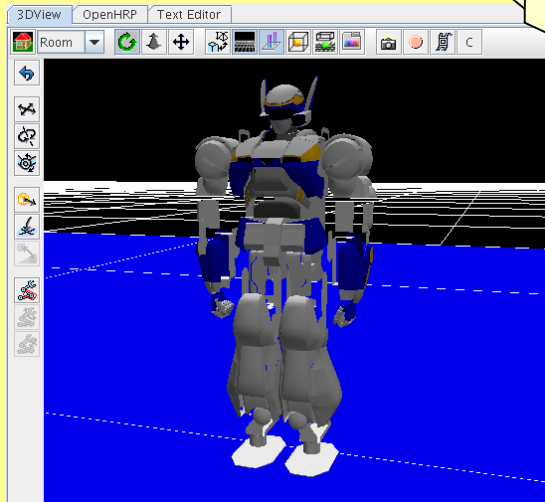
Physical display model of Robot Environment



1. Overview on GrxUI

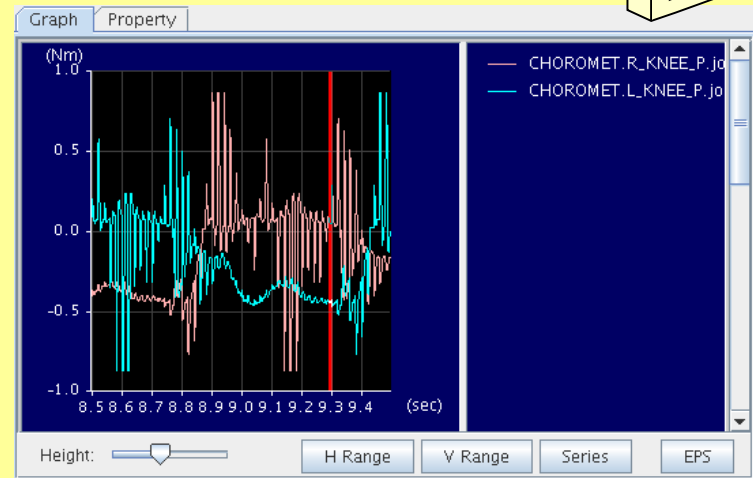
Example of View

3DView



- 3D Display/recording
- Initial settings

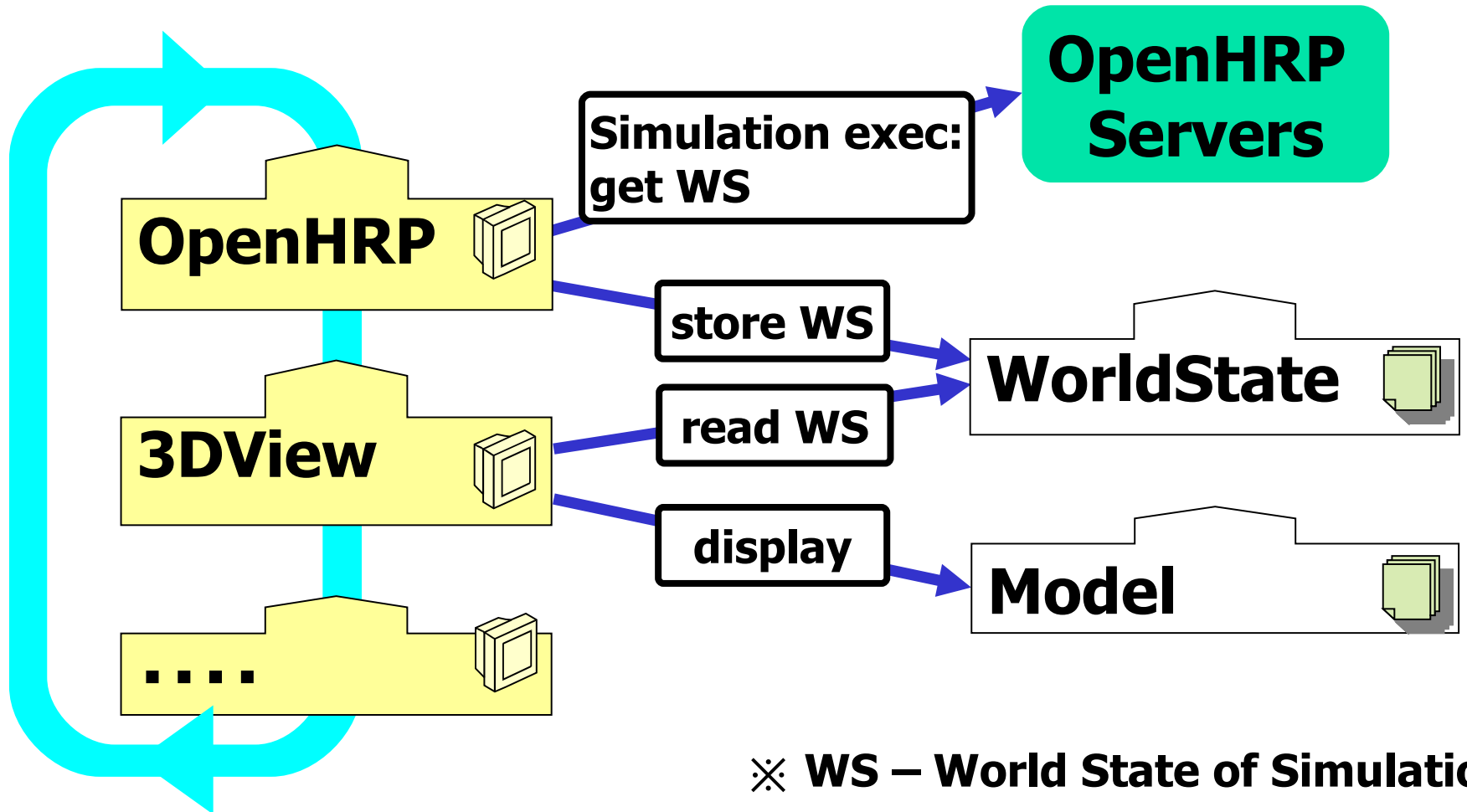
Graph



- Graph display
- Display settings

1. Overview on GrxUI

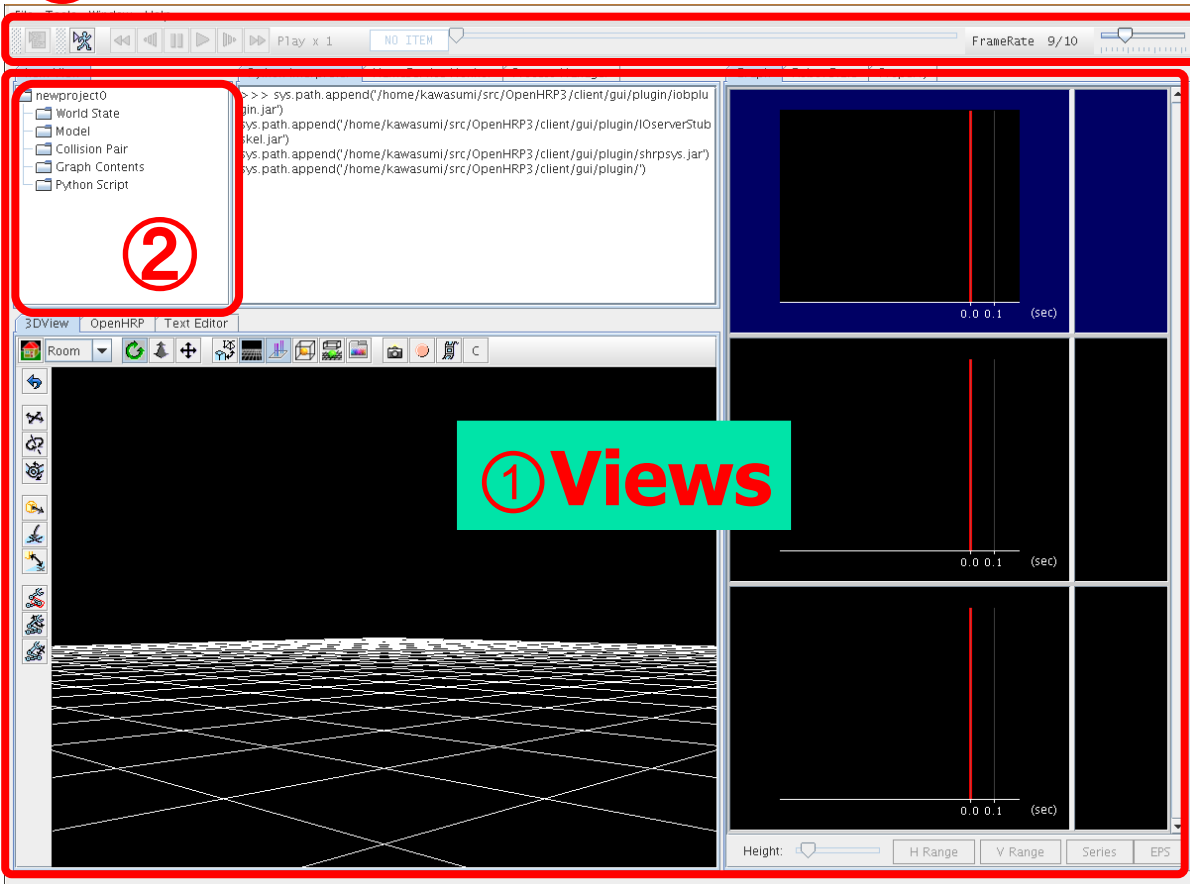
OpenHRP3 Execusion



1. Overview on GrxUI

Interface Layout

③



① **Views**

GUI panel of View

② **Item View**

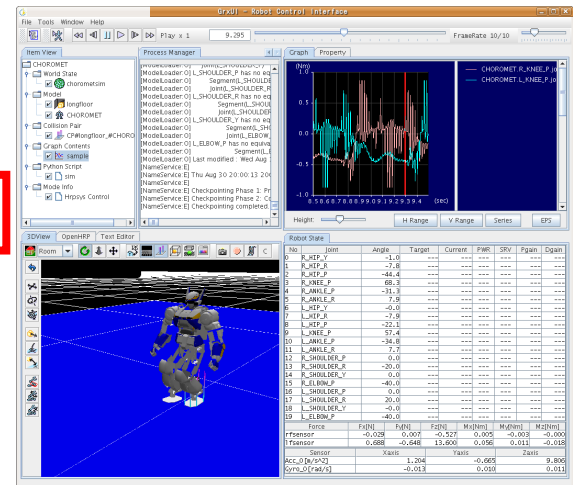
Tree-view of Items

③ **Toolbar**

frequently using tools

Next...

1. Overview on GrxUI
2. Sample Project Execution
3. Creating your own project
4. Other functions

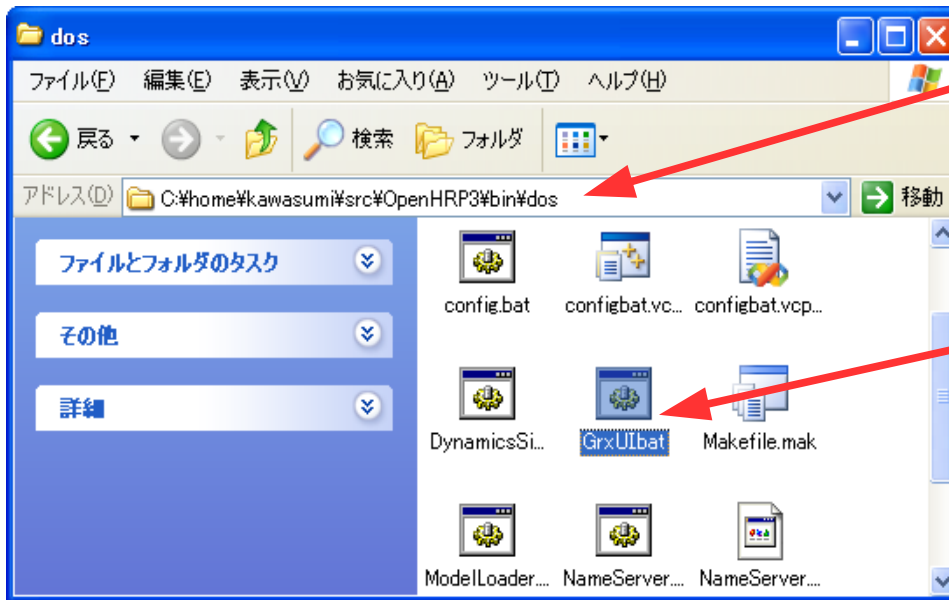


Describes the basic operations of GrxUI, by using a Sample Project.

2. Sample Project Execution

Starting GrxUI

On Windows



1. go to
OpenHRP3\bin\dos

2. Double-click
GrxUI.bat

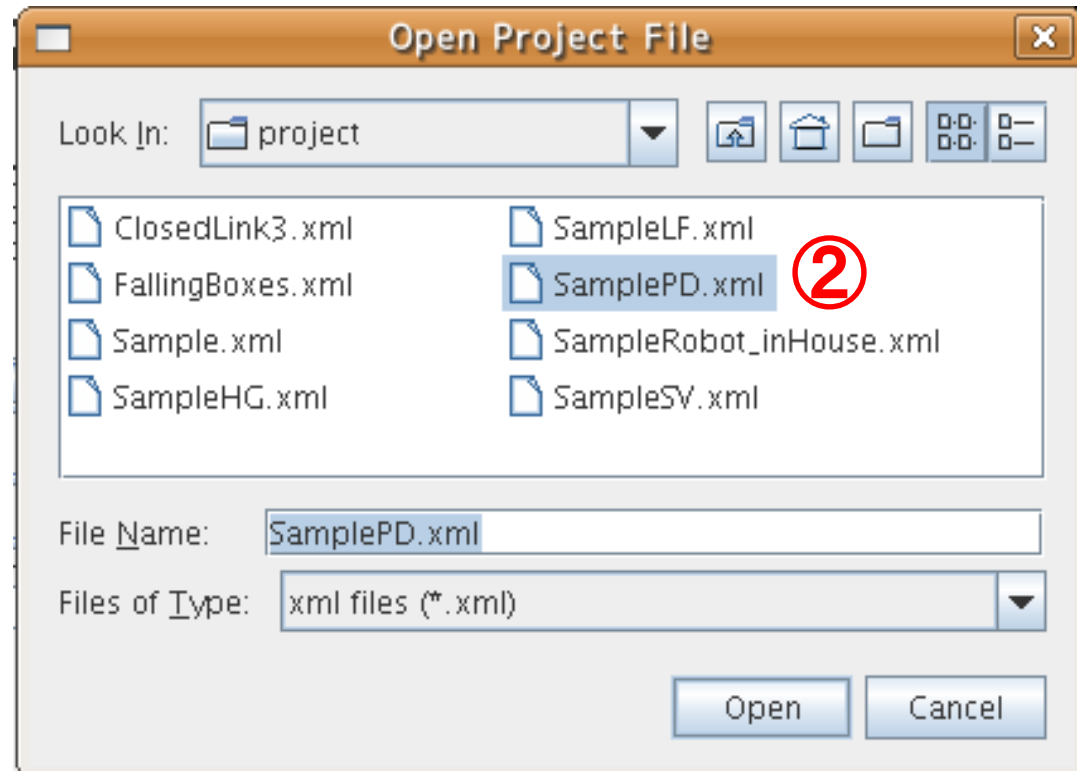
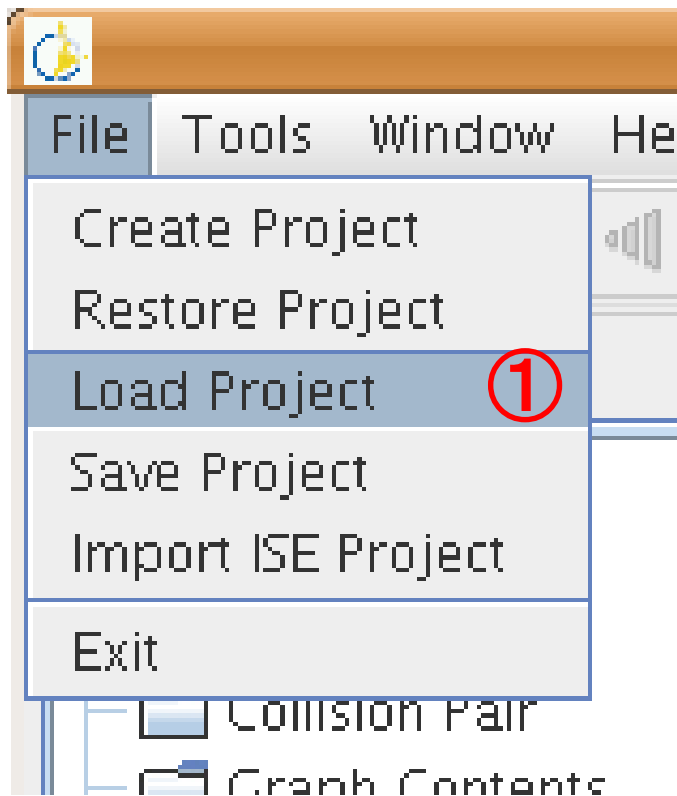
On Linux

```
$ cd <OpenHRP3 Home dir:>/bin/unix  
$ ./GrxUI.sh
```

2.Sample Project Execution

Loading Sample Project

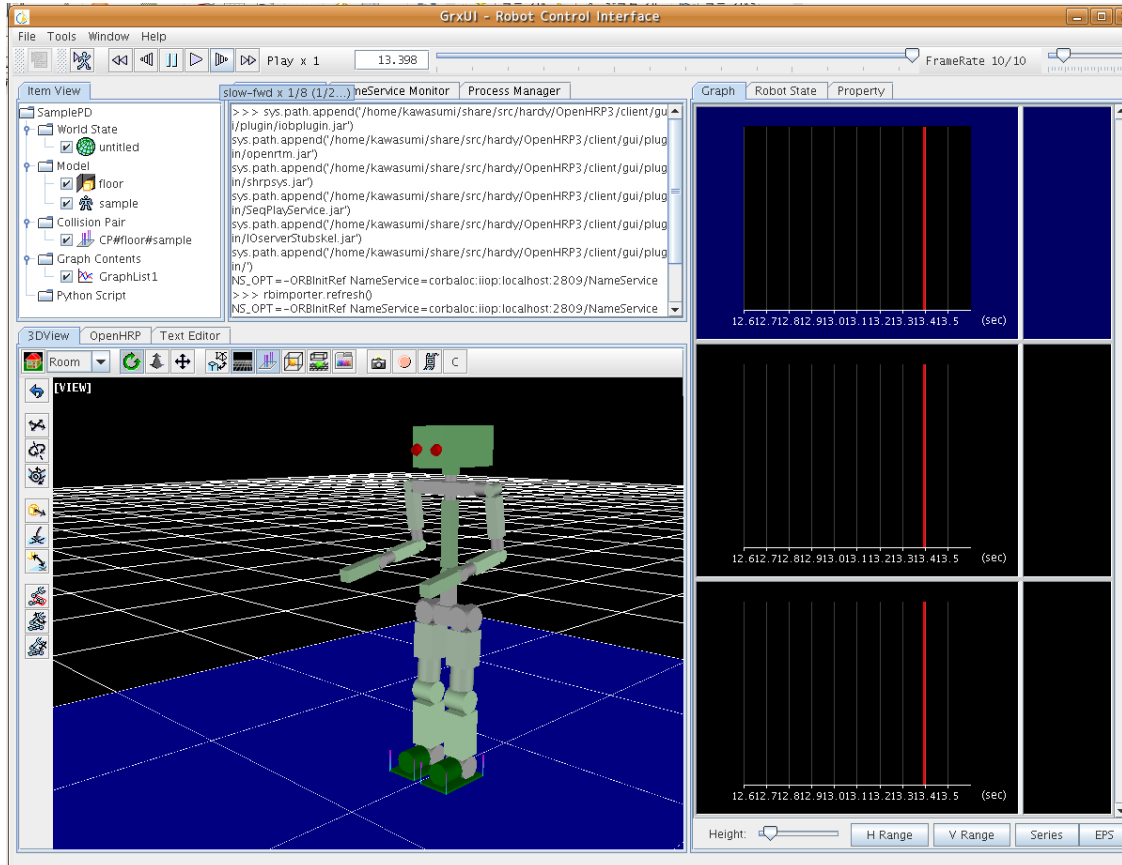
- ① Select, 'File' > 'Load Project'
- ② open 'SamplePD.xml'



2. Sample Project Execution

SamplePD.xml

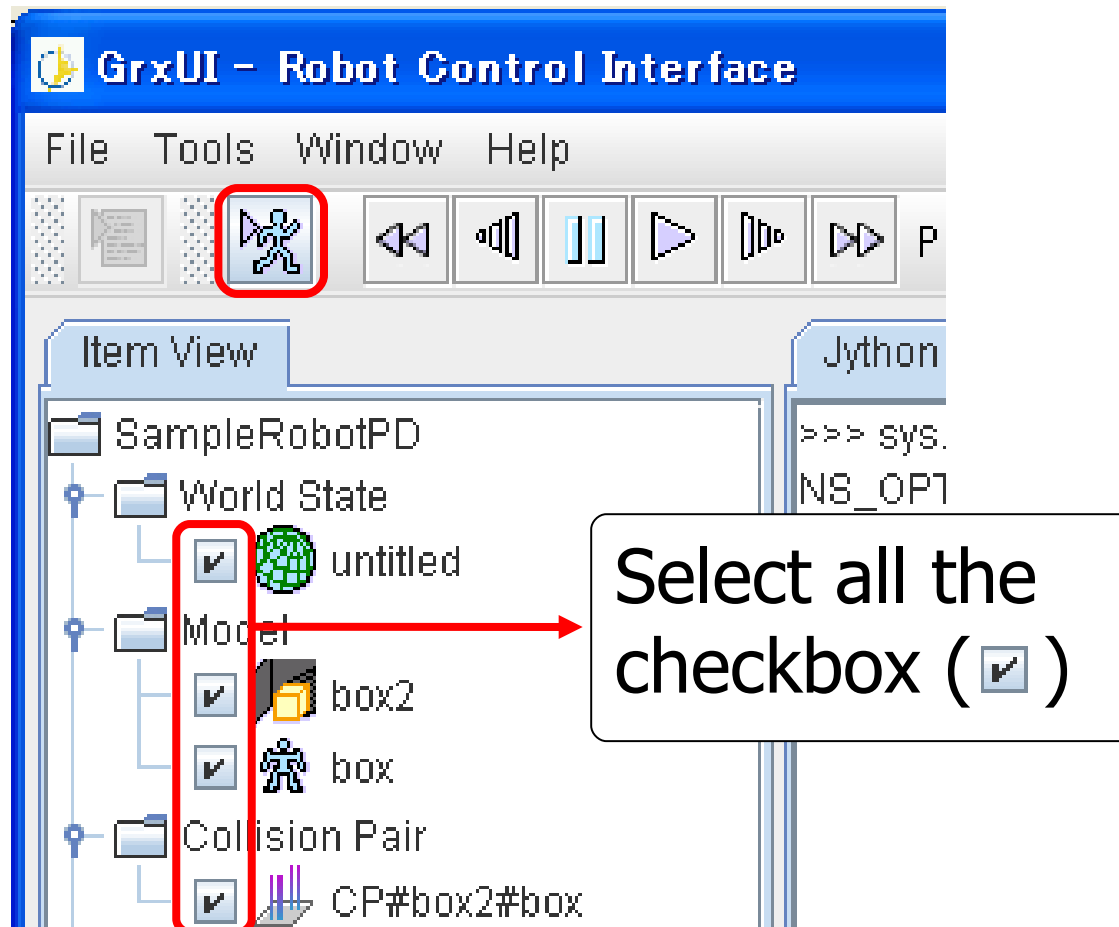
Walking simulation of a sample robot



2. Sample Project Execution

Start Simulation

Press 'Start Simulation' button ()



The screenshot shows the GrxUI - Robot Control Interface software. The title bar reads "GrxUI - Robot Control Interface". The menu bar includes "File", "Tools", "Window", and "Help". The toolbar contains several icons, with the "Start Simulation" button (a robot icon) highlighted by a red square. Below the toolbar is the "Item View" panel, which displays a tree structure of the simulation environment. The tree includes folders for "SampleRobotPD", "World State", "Model", and "Collision Pair". Under "World State", there is an "untitled" object with a checked checkbox. Under "Model", there are "box2" and "box" objects, both with checked checkboxes. Under "Collision Pair", there is a "CP#box2#box" object with a checked checkbox. A red arrow points from the "untitled" checkbox to a callout box that says "Select all the checkbox ()".

Select all the checkbox ()

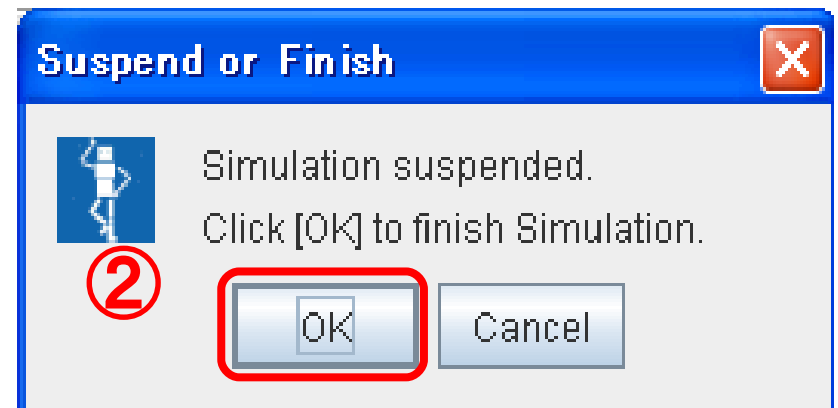
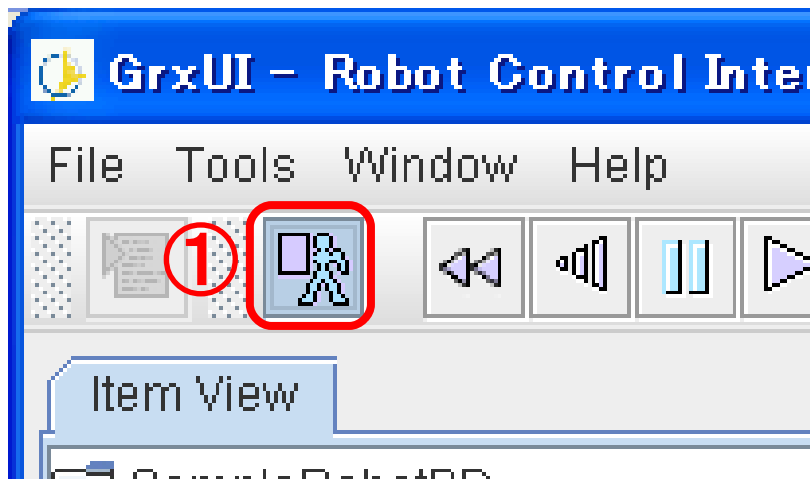
2.Sample Project Execution

Suspend/Finish Simulation

To Finish the simulation process, during execution...

① Press 'Suspend Simulation' button

② [OK] : Finish [Cancel] : Continue



2. Sample Project Execution

Playback Function

Review the simulation results, using Slider or 'PlayBack' button



Playback Toolbar

TimeSlider

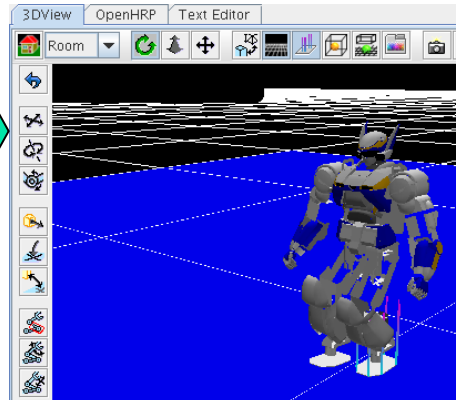
FrameRate Slider

Item View

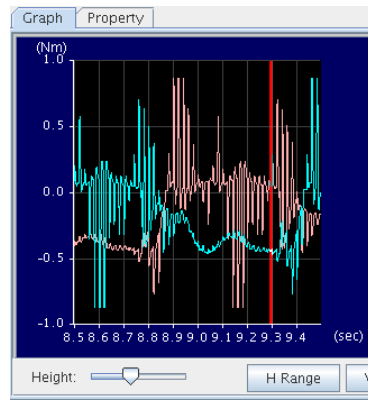
- CHOROMET
 - World State
 - chorometsim
 - Model
 - longfloor

Save the results in World State

3DView



Graph



Robot Stat

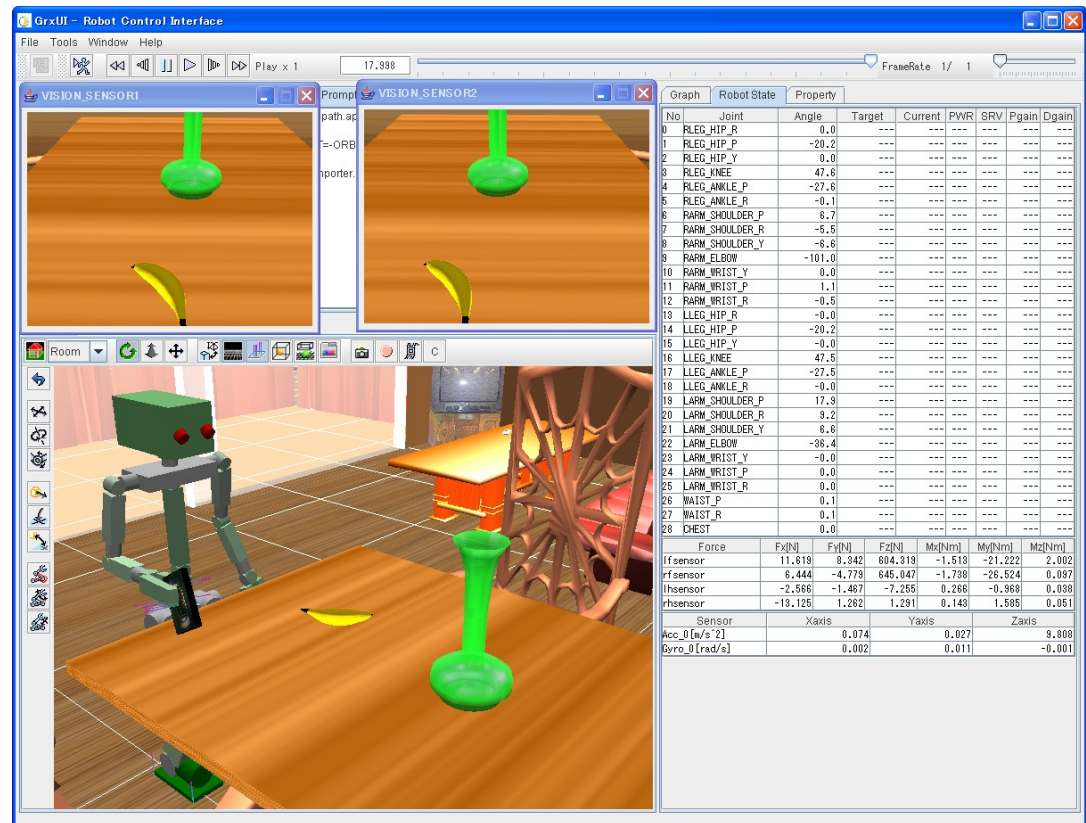
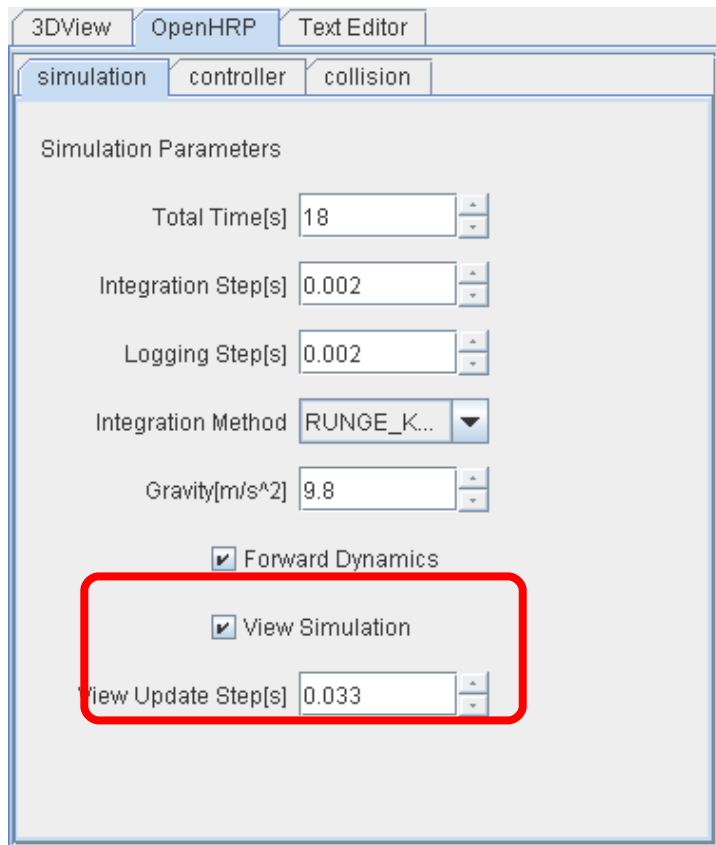
No.	Joint	Angle	Target	Current	PWR	SRV	Pgain	Dgain
0	R_HIP_Y	-1.0	---	---	---	---	---	---
1	R_HIP_R	-7.8	---	---	---	---	---	---
2	R_HIP_P	-44.4	---	---	---	---	---	---
3	R_KNEE_P	68.3	---	---	---	---	---	---
4	R_ANKLE_P	-31.3	---	---	---	---	---	---
5	R_ANKLE_R	7.9	---	---	---	---	---	---
6	L_HIP_Y	-0.0	---	---	---	---	---	---
7	L_HIP_R	-7.9	---	---	---	---	---	---
8	L_HIP_P	-22.1	---	---	---	---	---	---
9	L_KNEE_P	57.4	---	---	---	---	---	---
10	L_ANKLE_P	-34.8	---	---	---	---	---	---
11	L_ANKLE_R	7.7	---	---	---	---	---	---
12	R_SHOULDER_P	0.0	---	---	---	---	---	---
13	R_SHOULDER_R	-20.0	---	---	---	---	---	---
14	R_SHOULDER_Y	0.0	---	---	---	---	---	---
15	R_ELBOW_P	-40.0	---	---	---	---	---	---
16	L_SHOULDER_P	0.0	---	---	---	---	---	---
17	L_SHOULDER_R	20.0	---	---	---	---	---	---
18	L_SHOULDER_Y	-0.0	---	---	---	---	---	---
19	L_ELBOW_P	-40.0	---	---	---	---	---	---
Force		Fx[N]	Fy[N]	Fz[N]	Mx[Nm]	My[Nm]	Mz[Nm]	
rfsensor		-0.029	0.007	-0.527	0.005	-0.003	-0.000	
tsensor		0.688	-0.648	13.600	0.056	0.011	-0.018	
Sensor		Xaxis		Yaxis		Zaxis		
Acc_0 [m/s^2]		1.204		-0.665		9.806		
Gyro_0 [rad/s]		-0.013		0.010		0.011		

Display the WorldState at time, that TimeSlider indicates

2. Sample Project Execution

ViewSimulation Function

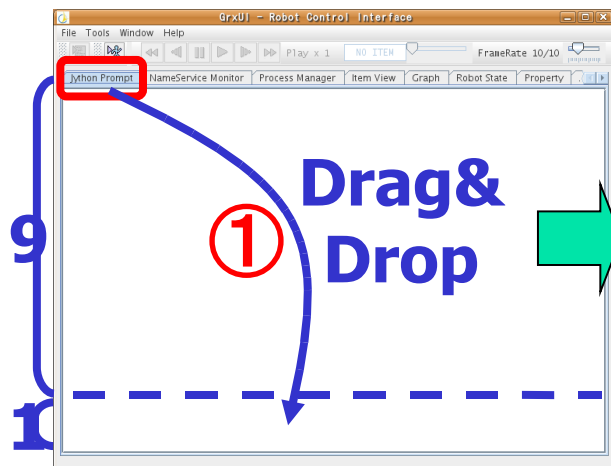
- Activate **View Simulation**, and then start Simulation
- Image and distance information are acquired by CORBA



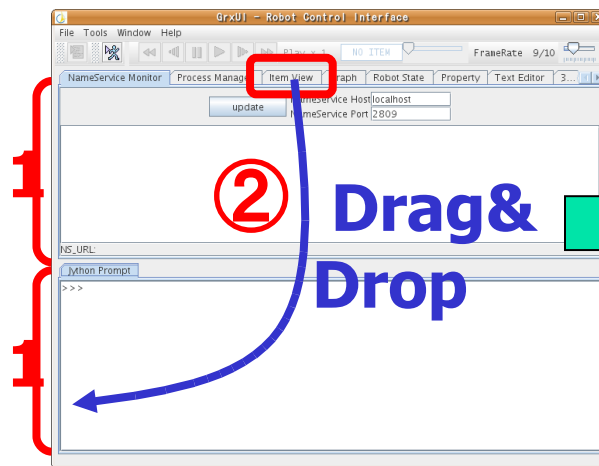
2. Sample Project Execution

Customize Interface Layout(1)

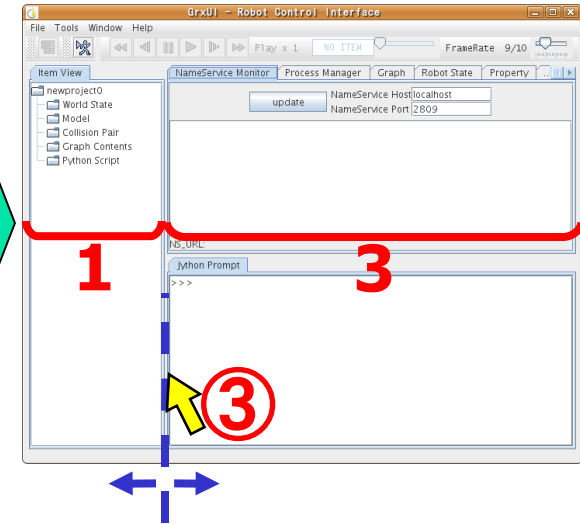
② Drag&Drop to the panel edge to set as 1:3 in size



① Arrange as up-down or left-right panels



③ Hold on separator and drag to fine-align



2. Sample Project Execution

Customize Interface Layout(2)

Double Click to maximize

The image illustrates the process of customizing the interface layout in three stages:

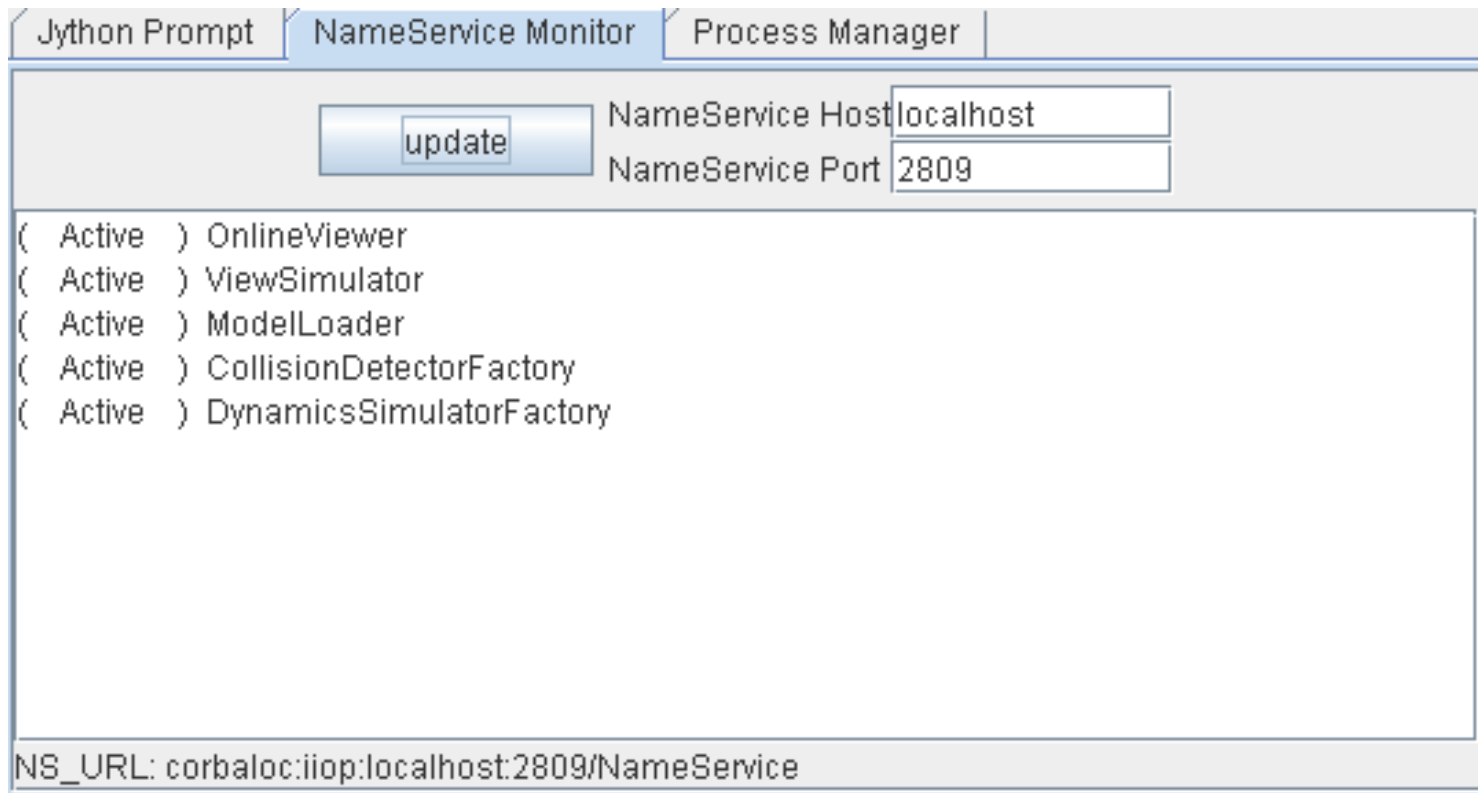
- Initial State:** The main window contains a 'NameService Monitor' panel. A yellow arrow points to this panel with the text 'Drag & Drop'.
- Dragging:** The 'NameService Monitor' panel is being dragged out of the main interface, as indicated by a green arrow and the text 'Drag & Drop'.
- Maximizing:** The 'NameService Monitor' panel is now a separate window. A green arrow points to the maximize button in the window's title bar with the text 'Double Click'.

**Drag&Drop out the panel
to pop-out as Window**

2. Sample Project Execution

NameService Monitor View

Display the Name list registered with CORBA NameService



The screenshot shows a window titled "NameService Monitor" with three tabs: "Jython Prompt", "NameService Monitor", and "Process Manager". The "NameService Monitor" tab is active. It contains an "update" button, two input fields for "NameService Host" (localhost) and "NameService Port" (2809), and a list of active objects. The list includes: (Active) OnlineViewer, (Active) ViewSimulator, (Active) ModelLoader, (Active) CollisionDetectorFactory, and (Active) DynamicsSimulatorFactory. At the bottom, the "NS_URL" is displayed as "corbaloc:iiop:localhost:2809/NameService".

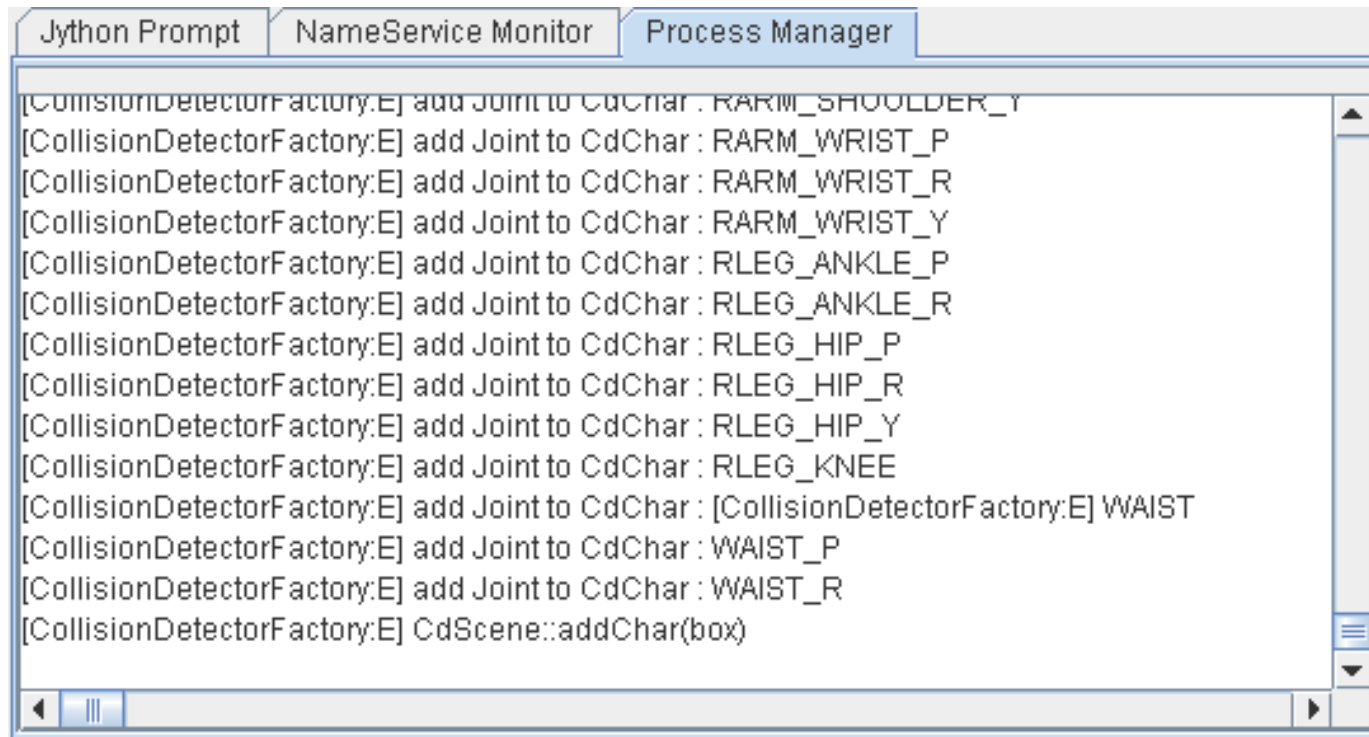
Object Name	Status
OnlineViewer	(Active)
ViewSimulator	(Active)
ModelLoader	(Active)
CollisionDetectorFactory	(Active)
DynamicsSimulatorFactory	(Active)

NS_URL: corbaloc:iiop:localhost:2809/NameService

2. Sample Project Execution

Process Manager View

- Display output of all processes started by GrxUI
- Right-click on panel, to set individual display settings
- Select 'Tools' > 'Process Manager' to start/finish

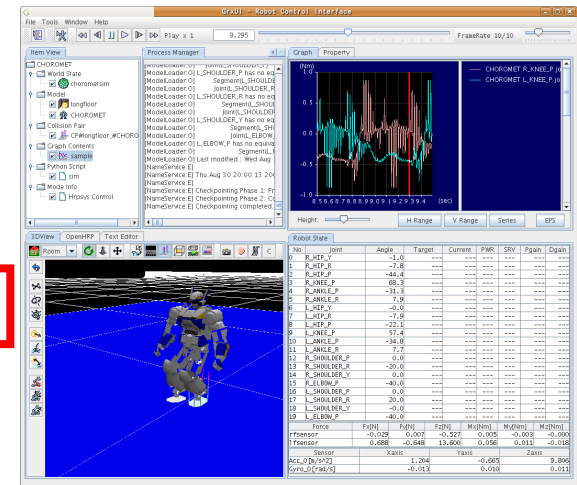


The screenshot shows a window titled 'Process Manager' with three tabs: 'Jython Prompt', 'NameService Monitor', and 'Process Manager'. The 'Process Manager' tab is active and displays a list of log messages from a 'CollisionDetectorFactory:E' process. The messages show the addition of joints to various 'CdChar' objects, including 'RARM_SHOULDER_Y', 'RARM_WRIST_P', 'RARM_WRIST_R', 'RARM_WRIST_Y', 'RLEG_ANKLE_P', 'RLEG_ANKLE_R', 'RLEG_HIP_P', 'RLEG_HIP_R', 'RLEG_HIP_Y', 'RLEG_KNEE', and 'WAIST'. The final message shows 'CdScene::addChar(box)'.

```
[CollisionDetectorFactory:E] add Joint to CdChar : RARM_SHOULDER_Y
[CollisionDetectorFactory:E] add Joint to CdChar : RARM_WRIST_P
[CollisionDetectorFactory:E] add Joint to CdChar : RARM_WRIST_R
[CollisionDetectorFactory:E] add Joint to CdChar : RARM_WRIST_Y
[CollisionDetectorFactory:E] add Joint to CdChar : RLEG_ANKLE_P
[CollisionDetectorFactory:E] add Joint to CdChar : RLEG_ANKLE_R
[CollisionDetectorFactory:E] add Joint to CdChar : RLEG_HIP_P
[CollisionDetectorFactory:E] add Joint to CdChar : RLEG_HIP_R
[CollisionDetectorFactory:E] add Joint to CdChar : RLEG_HIP_Y
[CollisionDetectorFactory:E] add Joint to CdChar : RLEG_KNEE
[CollisionDetectorFactory:E] add Joint to CdChar : [CollisionDetectorFactory:E] WAIST
[CollisionDetectorFactory:E] add Joint to CdChar : WAIST_P
[CollisionDetectorFactory:E] add Joint to CdChar : WAIST_R
[CollisionDetectorFactory:E] CdScene::addChar(box)
```

Next...

1. Overview on GrxUI
2. Sample Project Execution
3. Creating your own project
4. Other functions

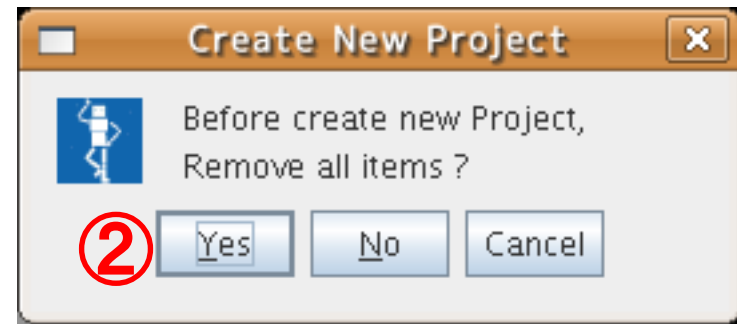
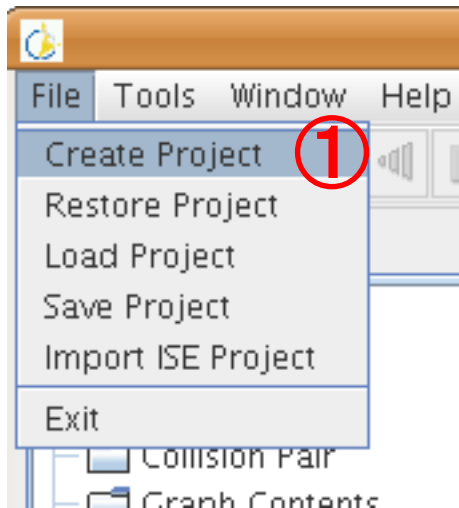


Here we describe, creating a project similar to *OpenHRP3/client/gui/project/SamplePD.xml*

3. Creating your own project

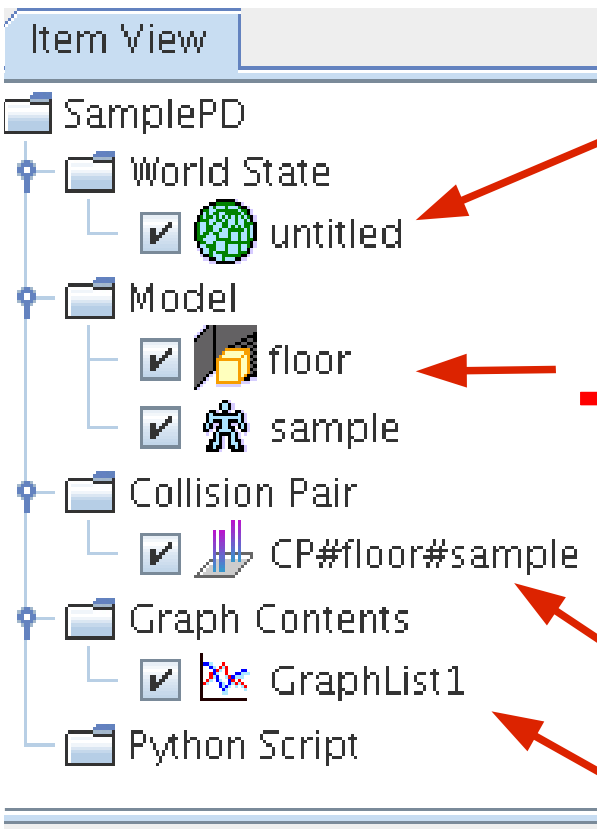
Creating a Project

- ① Select '**File**' > '**Create Project**'
- ② Select 'Yes' in the displaying dialog box, to remove all current items



3. Creating your own project

Procedure



1.Environment configuration

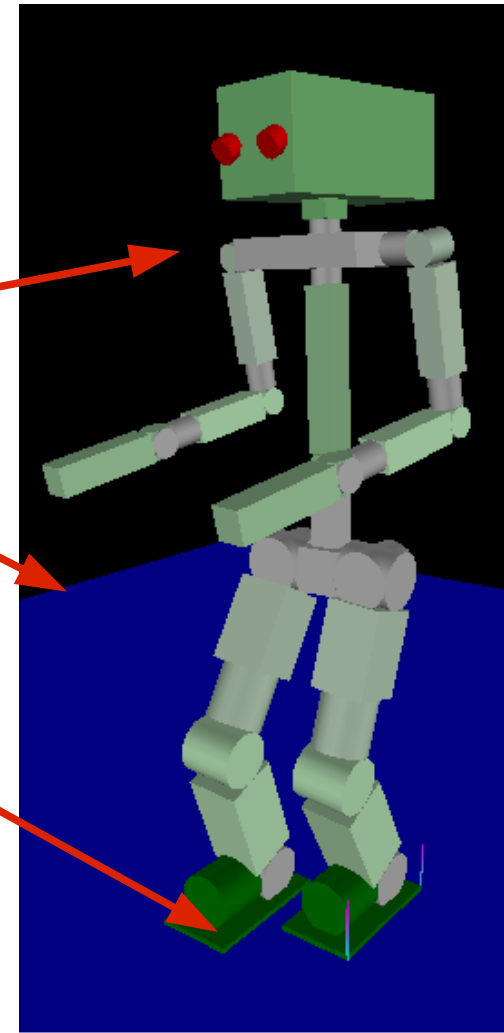
2.Load Model

3.Initial posture settings

4.Controller Settings

5.Collision Detector settings

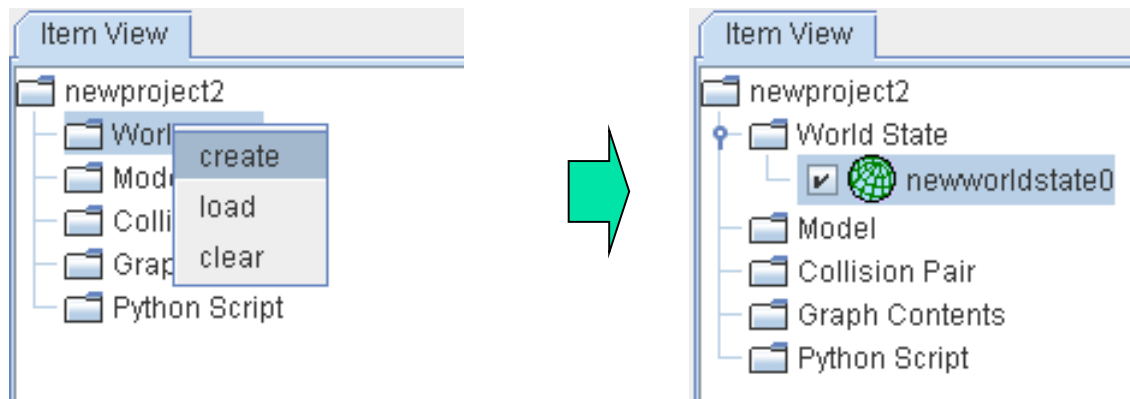
6.Graph settings



3. Creating your own project

Environment configuration (1)

Right-click on '**World State**' and select '**create**'



WorldState item stores Simulation Environment configuration as its properties

3. Creating your own project

Environment configuration (2)

Settings in Simulation tab

Total Simulation time: 13.4

Integration time step: 0.001

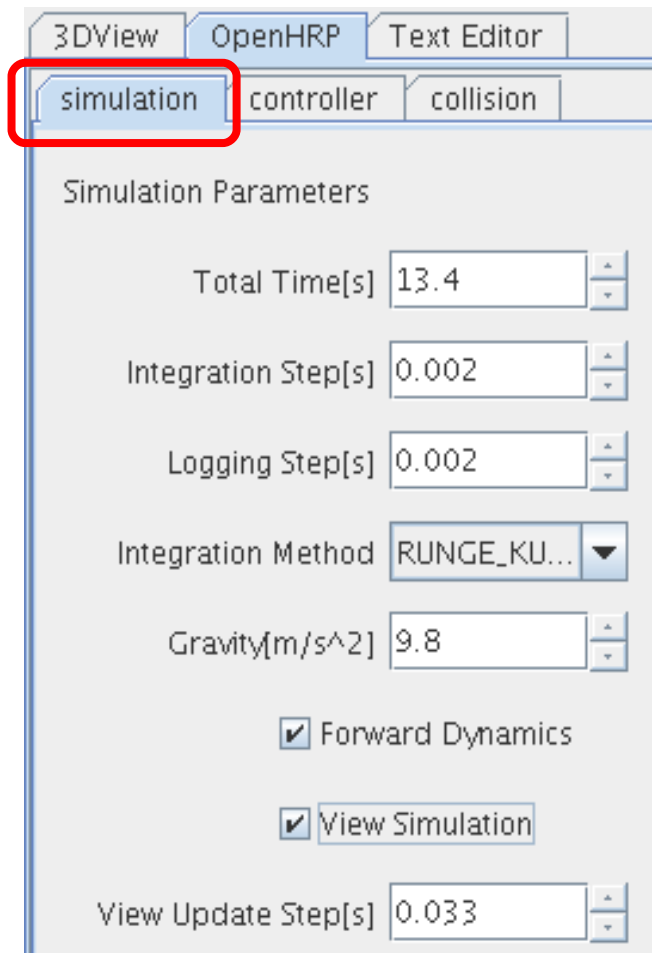
Logging period : 0.001

Integration algorithm: RUNGE_KUTTA

Gravity : 9.8

Forward Dynamics : ON

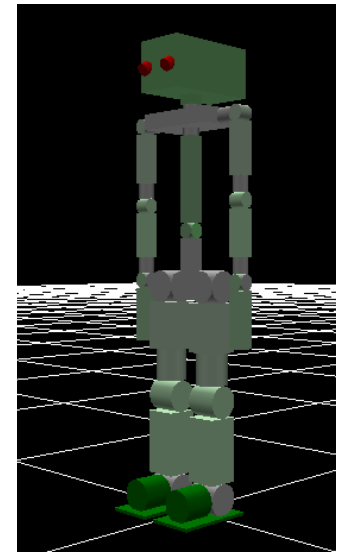
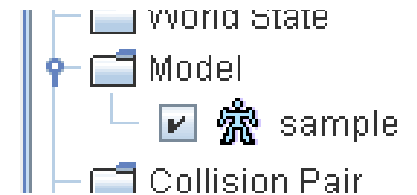
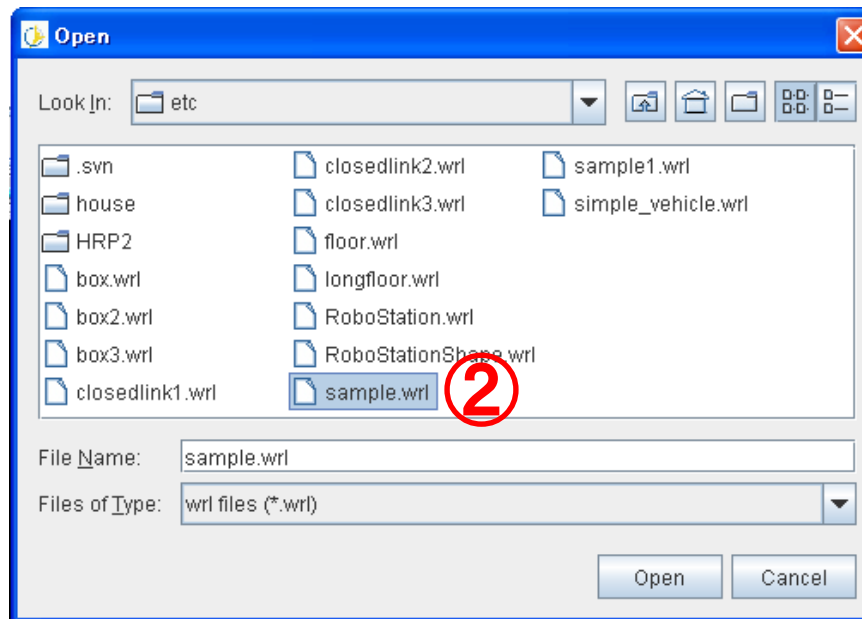
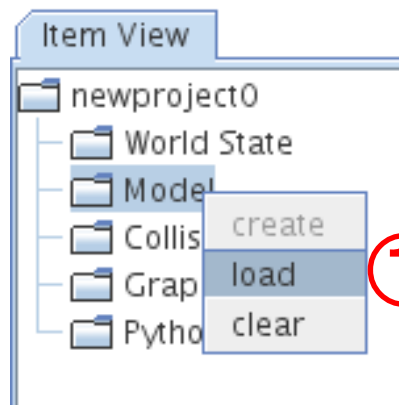
ViewSimulation : ON



3. Creating your own project

Loading Robot Model

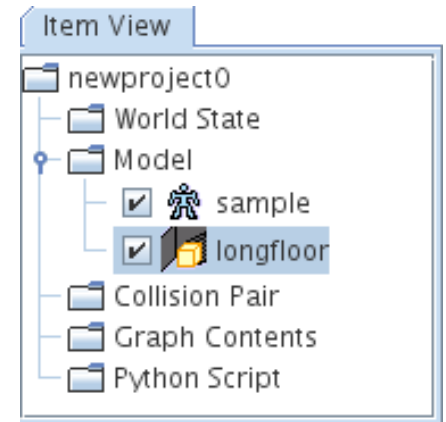
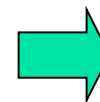
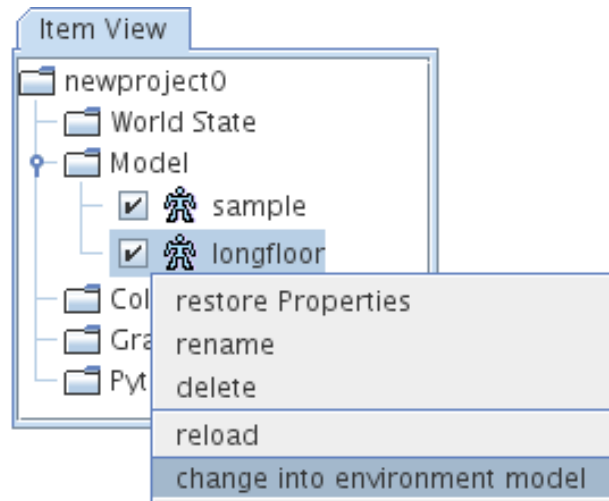
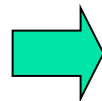
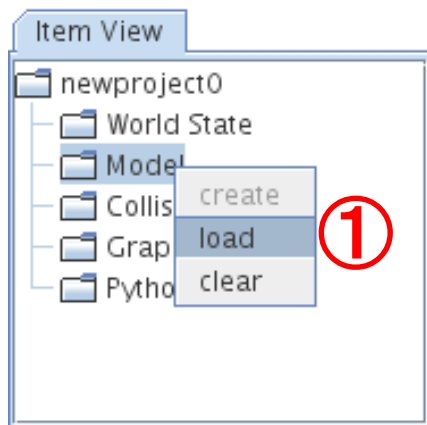
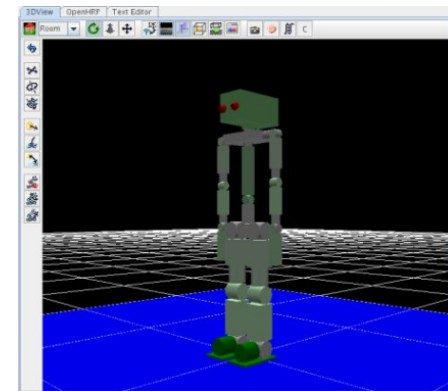
- ① Right-click on 'Model' and select 'load'
- ② Open, 'OpenHRP3/etc/sample.wrl'



3. Creating your own project

Loading Environment Model

- ① Load 'longfloor.wrl' as same as robot model
- ② Right-click on 'longfloor' and select 'change in to environment model'



3. Creating your own project

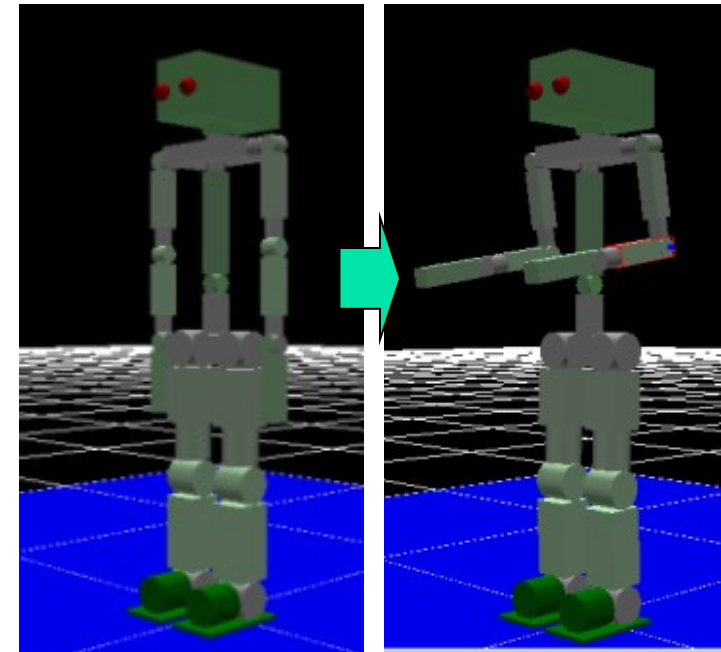
Model Initial Settings (sample)

Property View

Name ▾	Value
isRobot	true
controller	PDcontroller
controlTime	0.0020
WAIST_R.angle	0.0
WAIST_P.angle	0.0
WAIST.translation	0.0 0.0 0.714

⋮

RARM_SHOULDER_P.angle	0.173
RARM_ELBOW.angle	-1.57 (Radian)
LEFT_KNEE.angle	0.0705



3. Creating your own project

Model Initial Settings (1)

Set values in **Property View**

WAIST.translation

set model position

x[m] y[m] z[m]

WAIST.rotation

set orientation

x y z θ [rad]

(rot: axis vector) (rot: angle)

JOINT_AXIS.angle

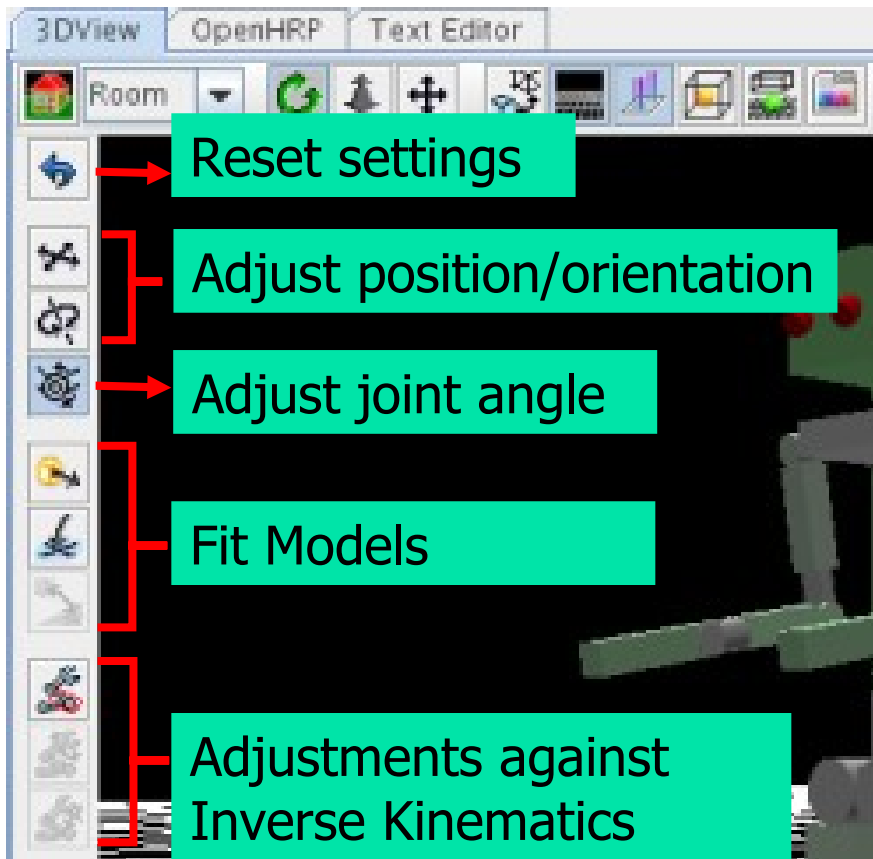
Joint Angle in **[rad]**

Graph	Robot State	Property	
		Name ▾	
		isRobot	true
		imageProcessor	
		imageProcessTime	5
		controller	CHOROMETCont
		controlTime	0.001
		WAIST.translation	0.0 0.0 0.18995
		WAIST.rotation	0.0 1.0 0.0 0.0
		R_SHOULDER_Y.angle	0.0
		R_SHOULDER_R.angle	0.0
		R_SHOULDER_P.angle	0.0
		R_KNEE_P.angle	0.0
		R_HIP_Y.angle	0.0
		R_HIP_R.angle	0.0
		R_HIP_P.angle	0.0
		R_ELBOU_P.angle	0.0
		R_ANKLE_R.angle	0.0
		R_ANKLE_P.angle	0.0

3. Creating your own project

Model Initial Settings (2)

3DView

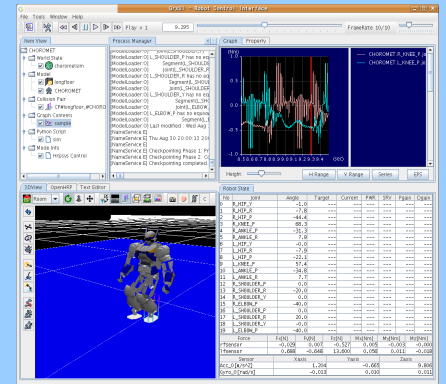
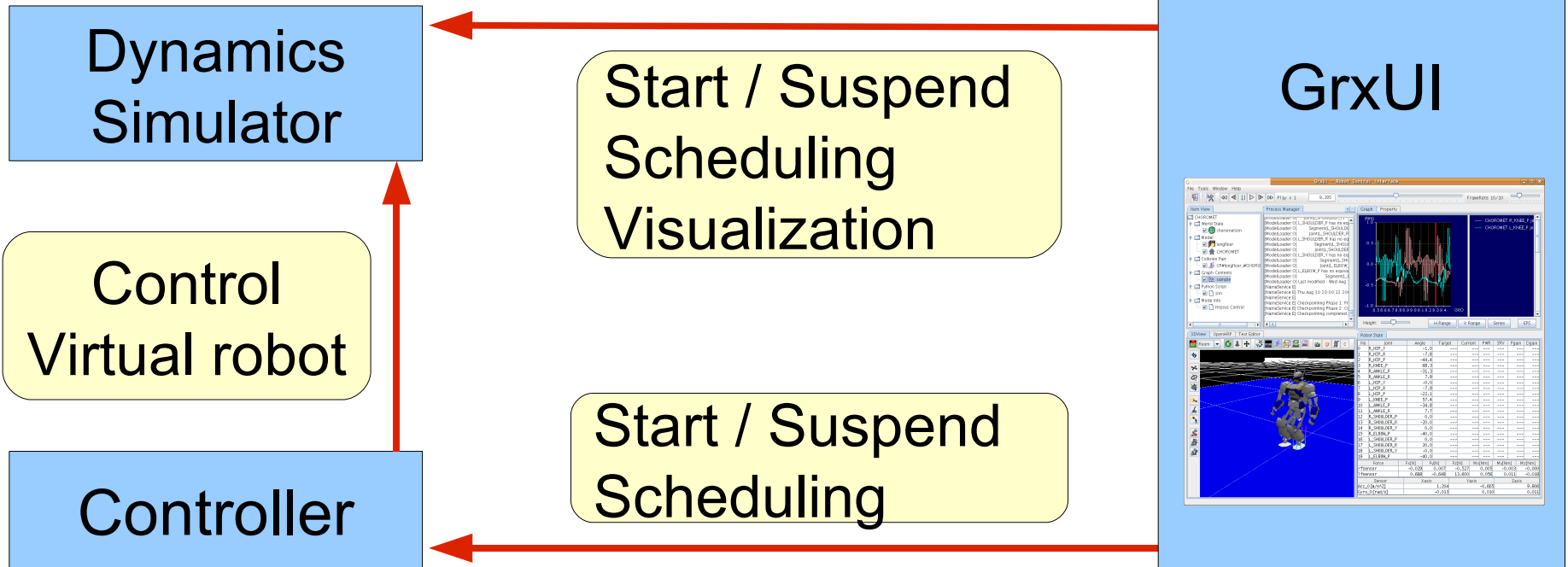
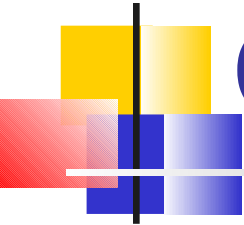


Robot State View

No	Joint	Angle	Target	Current	PWR	SRV	Pgain	Dgain
0	RLEG_HIP_R	0.0	---	---	---	---	---	---
1	RLEG_HIP_P	-2.1	---	---	---	---	---	---
2	RLEG_HIP_Y	0.0	---	---	---	---	---	---
3	RLEG_KNEE	4.5	---	---	---	---	---	---
4	RLEG_ANKLE_P	-2.4	---	---	---	---	---	---
5	RLEG_ANKLE_R	0.0	---	---	---	---	---	---
6	RARM_SHOULDER_P	10.0	---	---	---	---	---	---
7	RARM_SHOULDER_R	-0.2	---	---	---	---	---	---
8	RARM_SHOULDER_Y	0.0	---	---	---	---	---	---
9	RARM_ELBOW	-90.0	---	---	---	---	---	---
10	RARM_WRIST_Y	0.0	---	---	---	---	---	---
11	RARM_WRIST_P	0.0	---	---	---	---	---	---
12	RARM_WRIST_R	0.0	---	---	---	---	---	---
13	LLEG_HIP_R	0.0	---	---	---	---	---	---
14	LLEG_HIP_P	-2.1	---	---	---	---	---	---
15	LLEG_HIP_Y	0.0	---	---	---	---	---	---
16	LLEG_KNEE	4.5	---	---	---	---	---	---
17	LLEG_ANKLE_P	-2.4	---	---	---	---	---	---
18	LLEG_ANKLE_R	0.0	---	---	---	---	---	---
19	LARM_SHOULDER_P	10.0	---	---	---	---	---	---
20	LARM_SHOULDER_R	-0.2	---	---	---	---	---	---
21	LARM_SHOULDER_Y	0.0	---	---	---	---	---	---
22	LARM_ELBOW	-90.0	---	---	---	---	---	---
23	LARM_WRIST_Y	0.0	---	---	---	---	---	---
24	LARM_WRIST_P	0.0	---	---	---	---	---	---
25	LARM_WRIST_R	0.0	---	---	---	---	---	---
26	WAIST_P	0.0	---	---	---	---	---	---
27	WAIST_R	0.0	---	---	---	---	---	---
28	CHEST	0.0	---	---	---	---	---	---

3. Creating your own project

Controller



Project : SamplePD.xml

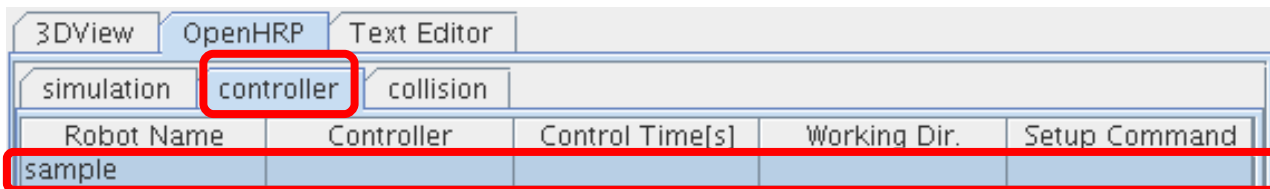
Path: OpenHRP/Controller/rtc/SamplePD/SamplePD.sh

CORBA ID: SamplePDController

3. Creating your own project

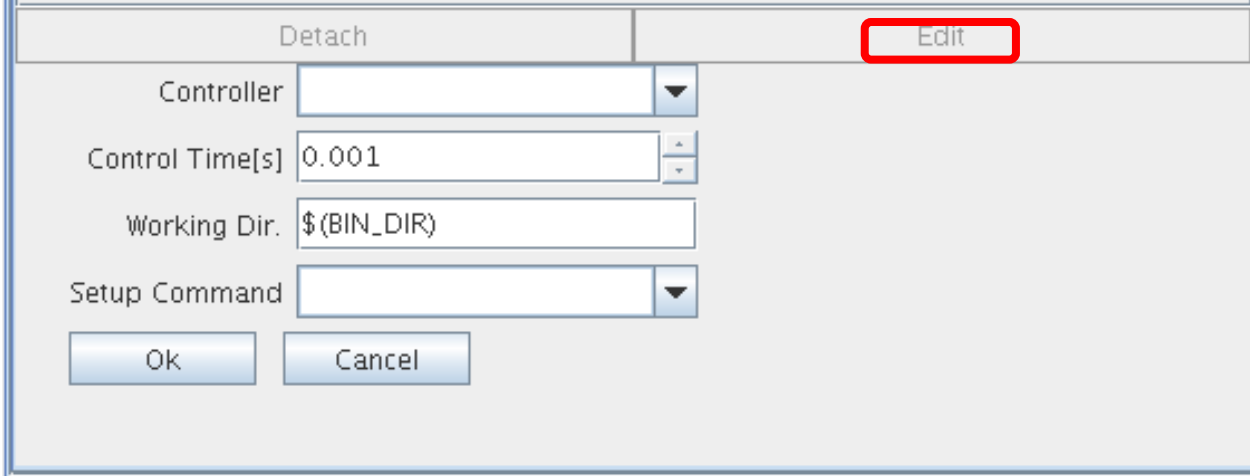
Controller Settings (1)

① Select '**OpenHRP**' -> '**Controller**' tab



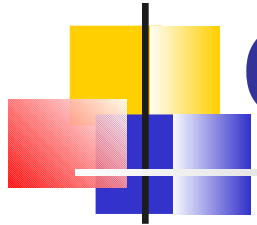
② select model

③ press '**Edit**' button



3. Creating your own project

Controller Settings (2)



Detach

Controller	<input type="text" value=""/>	④
Control Time[s]	<input type="text" value="0.001"/>	⑤
Working Dir.	<input type="text" value="\$ (BIN_DIR)"/>	⑥
Setup Command	<input type="text" value=""/>	⑦

Ok Cancel

④ CORBA Id
Ex: SamplePDController

⑤ Controller cycle
Ex: 0.002

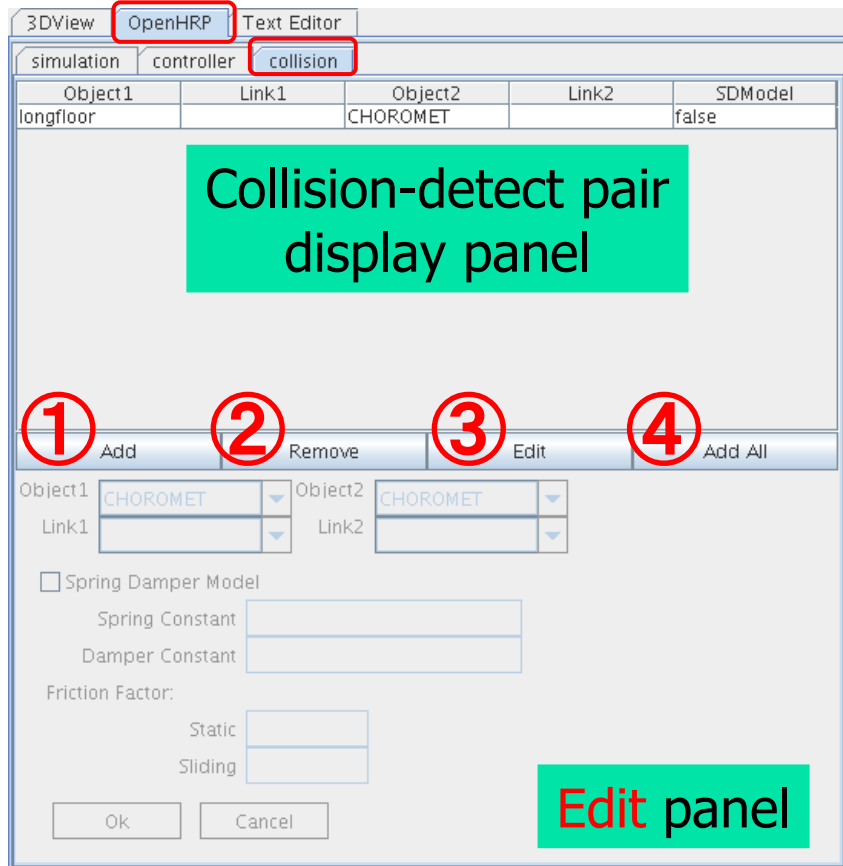
⑥ Working directory
Ex: \$(OPENHRPHOME)/
Controller/rtc/SamplePD/

⑦ start-up script
Ex: SamplePD.sh

3. Creating your own project

Collision-detect pair (1)

Select 'OpenHRP' -> 'collision' tab



- ① **Add**
add Collision-detect pair
- ② **Remove**
delete selected pair
- ③ **Edit**
edit Collision-detect pair
- ④ **Add All**
add all pairs in selected model

3. Creating your own project

Collision-detect pair (2)

Editing Collision-detect pair

① Object1/2

- Select model
- Becomes active when newly creating a pair, using Add button

② Link1/2

- Select Link
- skip, intended for all links

③ Friction Factor

- set Friction Factor

Object1: longfloor ①

Object2: sample

Link1: ②

Link2:

Spring Damper Model

Spring Constant: 0 0 0 0 0 0

Damper Constant: 0 0 0 0 0 0

Friction Factor:

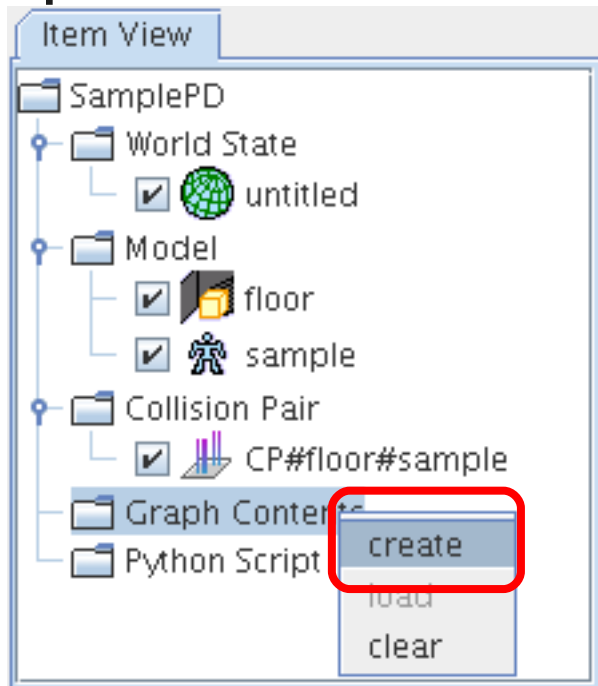
Static: 0.5 ③

Sliding: 0.5

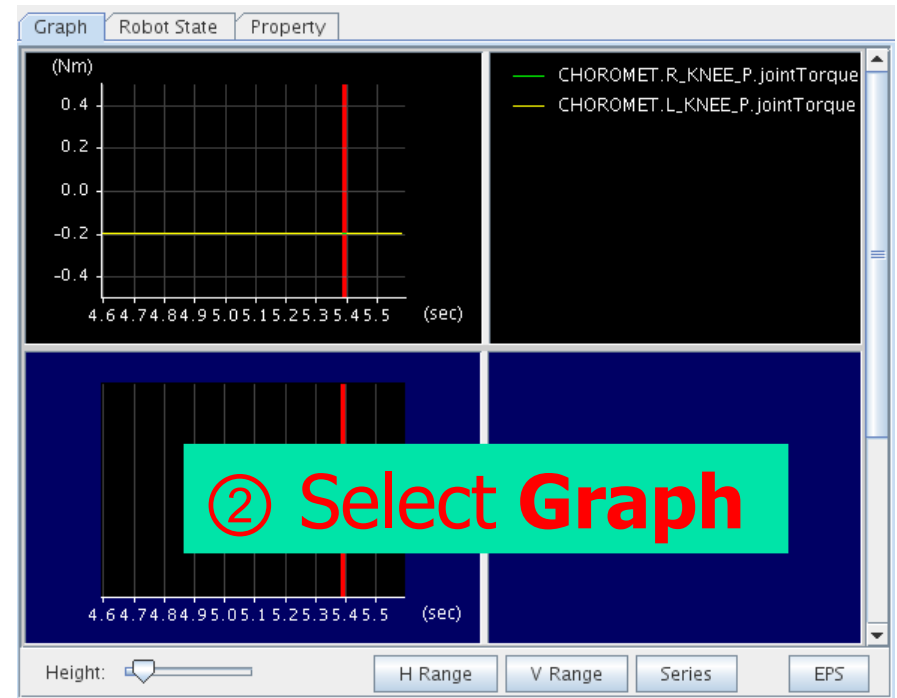
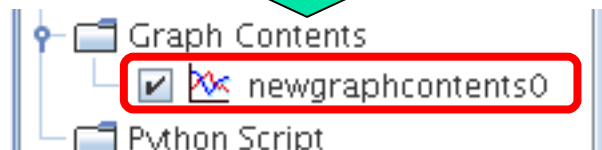
Editing panel

3. Creating your own project

Graph Content Settings (1)



① create **Graph Contents**

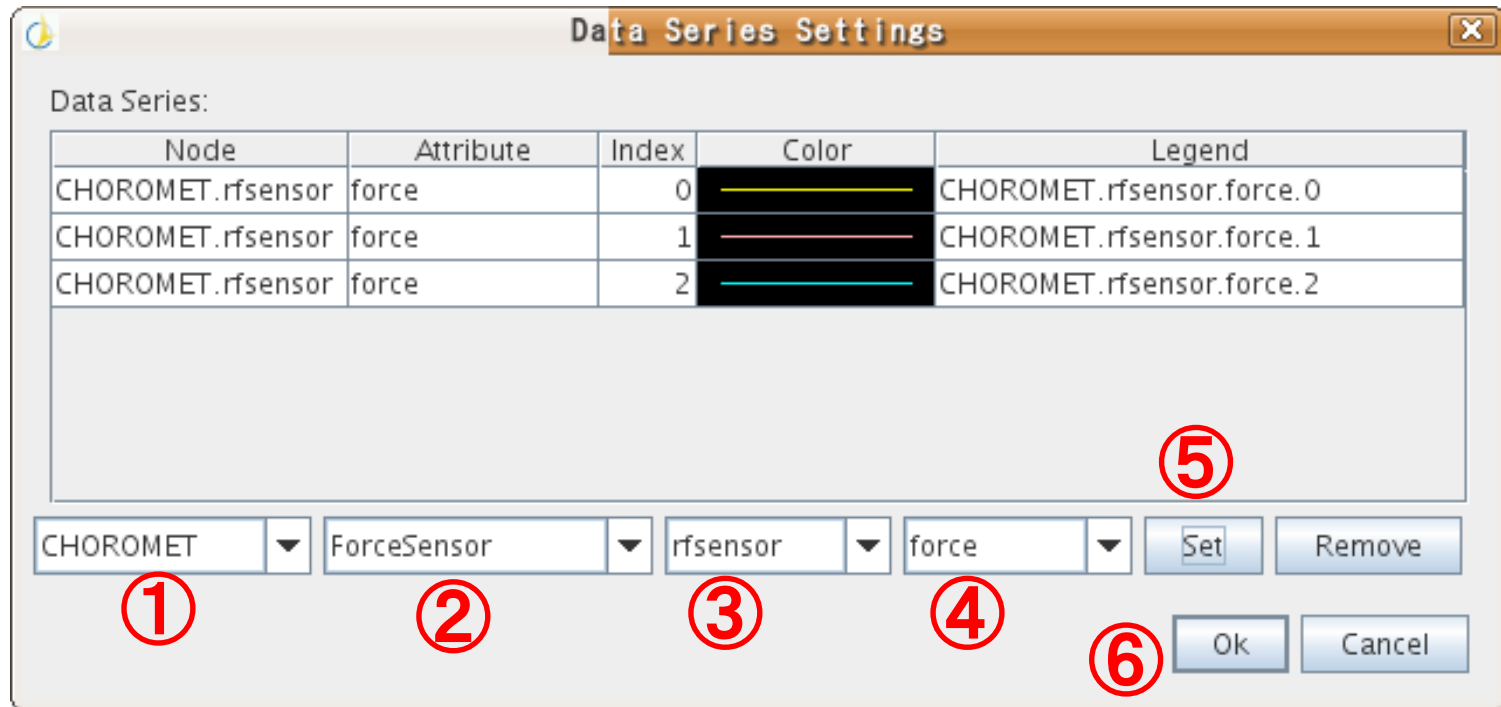


③ press '**Series**' button

3. Creating your own project

Graph Content Settings (2)

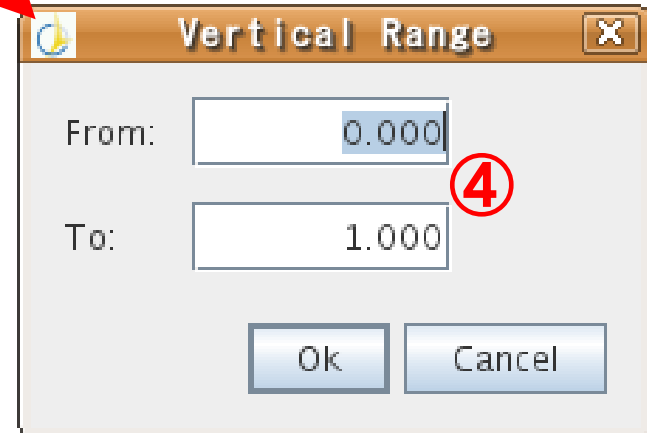
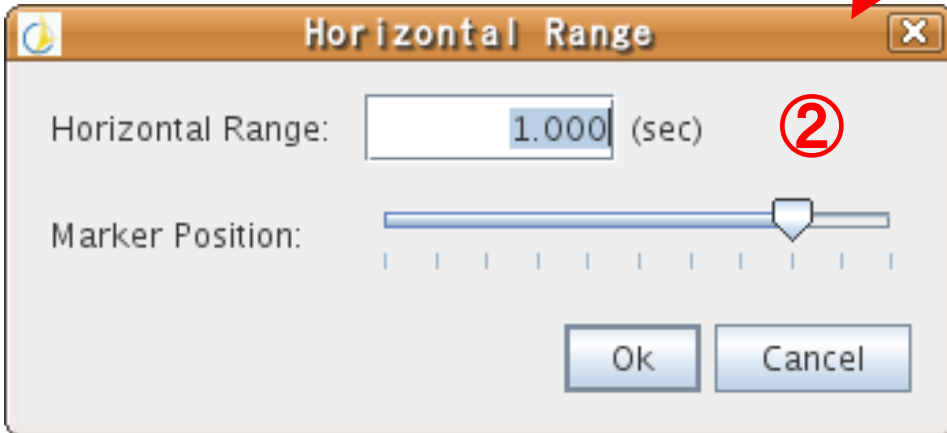
- ① Select robot name
- ② Select Sensor type
- ③ Select Node name
- ④ Select Attribute
- ⑤ press **Set**
- ⑥ press **OK**



3. Creating your own project

Graph Content Settings (3)

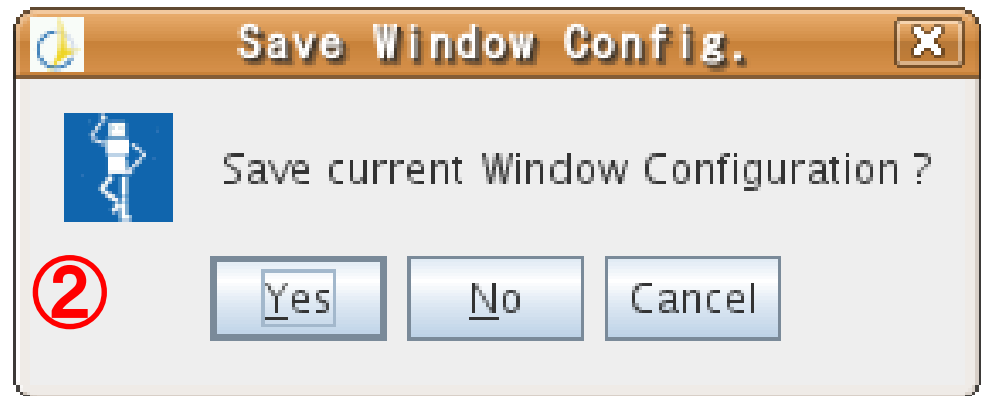
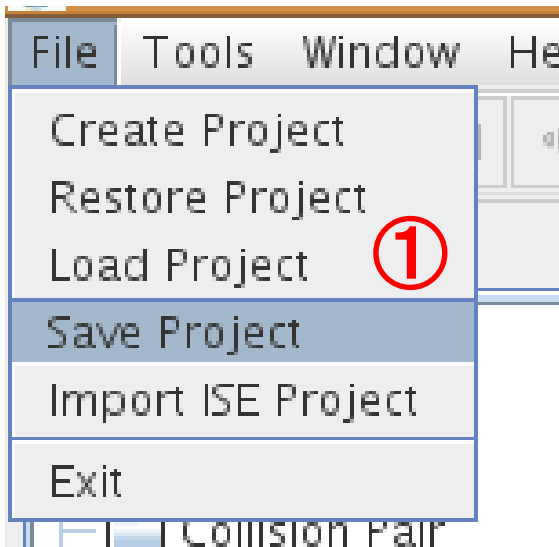
- ① Graph height
- ② Horizontal range (X axis)
- ③ Red-Marker position
- ④ Vertical range (Y axis)
- ⑤ Snap shot



3. Creating your own project

Saving Project

- ① Select 'File' -> 'Save Project' and save as 'SampleTest'
 - ② 'Save Window Config.' dialog box
- Yes**: Save the project, including window Config.
No: Save the project, without including window config.
Cancel: Cancel saving project



3. Creating your own project

Project File Layout

```
<mode name="OpenHRP3">
```

```
  <item class="className" name="displayName" url="URL" select="true">
    <property name="propertyName" value="value"/>
  </item>
```

...

Item Settings

```
  <view class="className" name="displayName">
    <property name="propertyName" value="value"/>
  </view>
```

...

View Settings

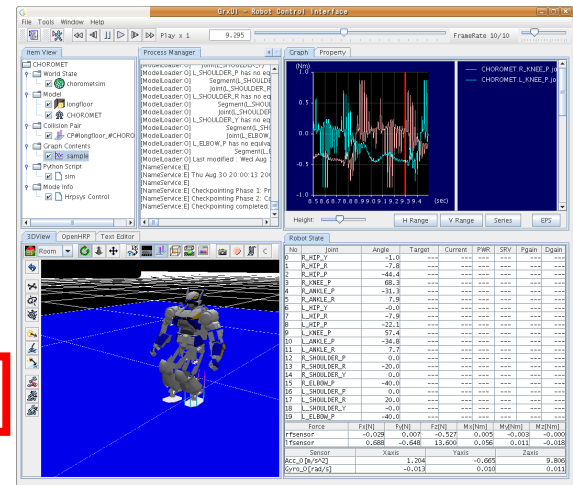
```
  <windowconfig>
    ...
  </windowconfig>
```

Window Configuration

```
</mode>
```


Next...

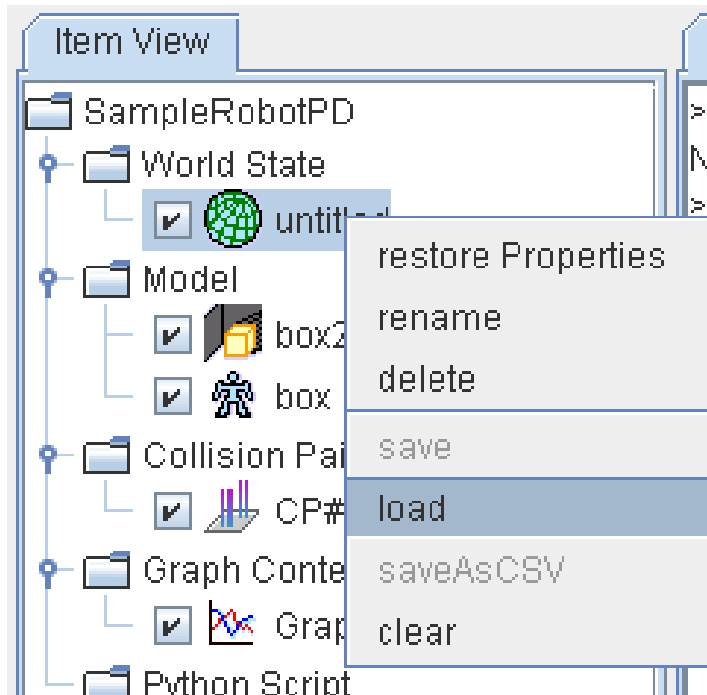
1. Overview on GrxUI
2. Sample Project Execution
3. Creating your own project
4. Other functions



4. Other Functions

Save/Load Simulate Results

Right-click on 'World State' -> 'untitled'
select Save/Load



Save as
'client/gui/log/untitled.log'

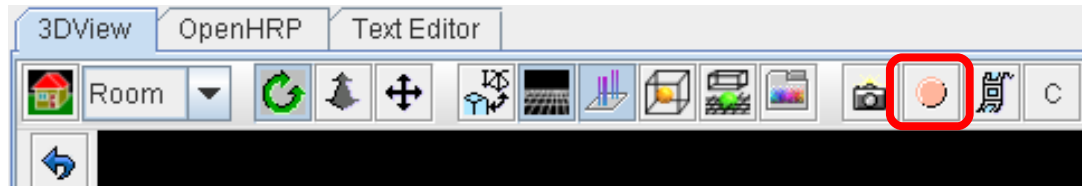
4. Other Functions

Movie Recording

① set to 33

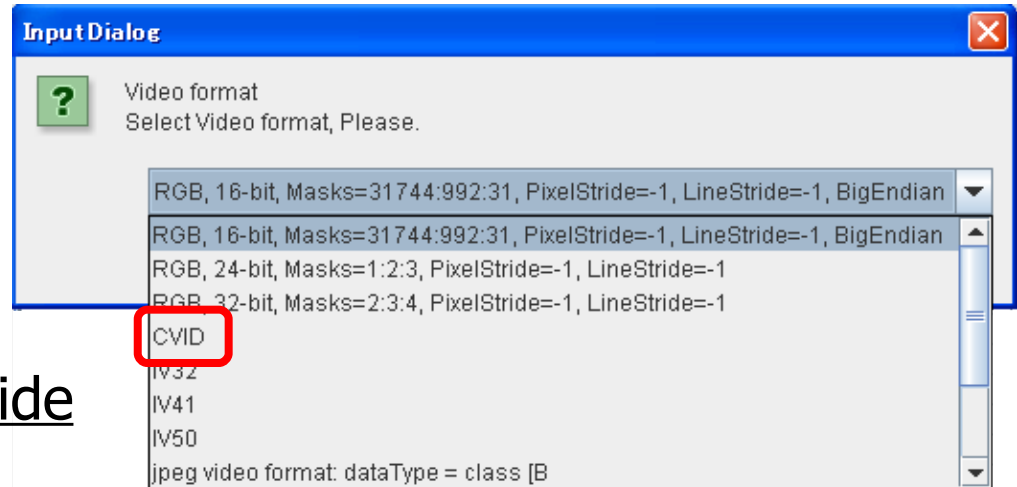
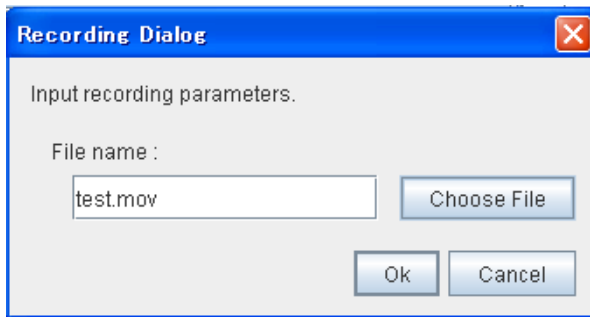


② press 'record' button



③ Choose saving location

④ Select Video format



To attach on **PowerPoint** slide

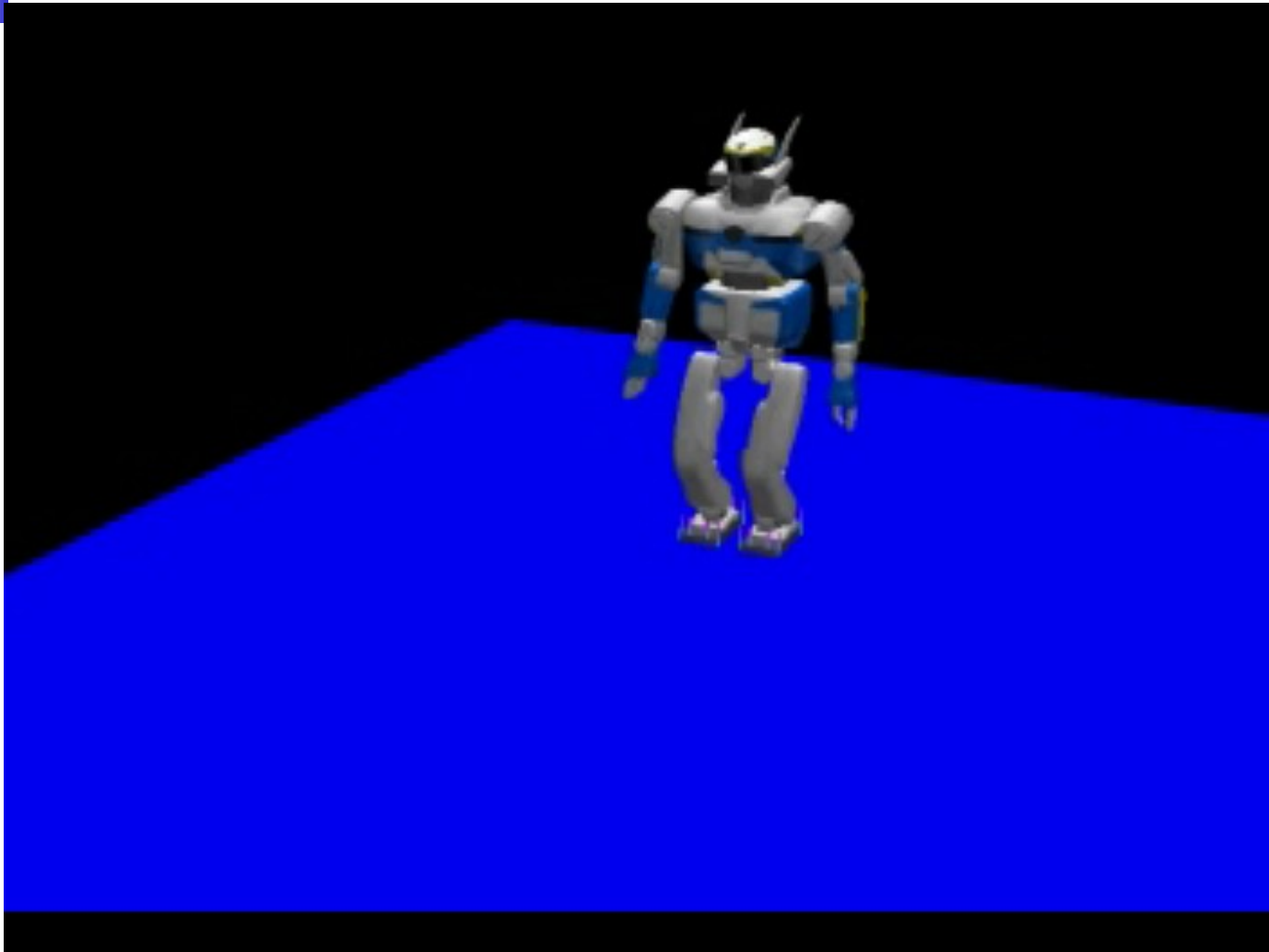
Windows : Select **CVID**

Linux : keep with default settings,

convert to mpeg using **TMpegEnc+QTReader**

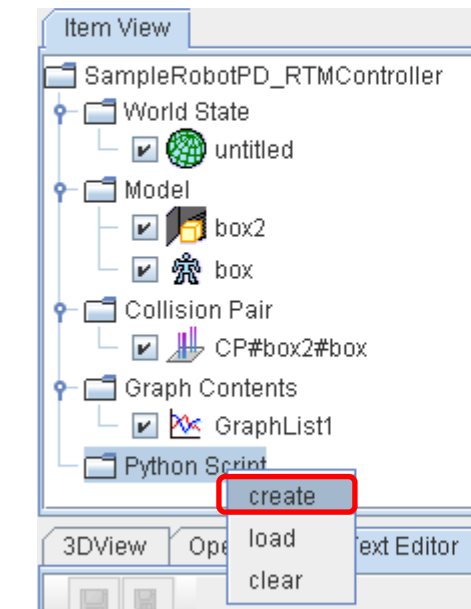
4. Other Functions

Movie Recording (sample)

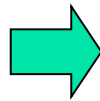


4. Other Functions

Running Script



① create script
on **ItemView**



A screenshot of the software interface showing the 'Run' button highlighted in the toolbar. The 'Jython Prompt' window displays the following output:

```
>>> sys.path.append('C:/home/kawasumi/src/OpenHRP3P/client/guiscrpt/newpyt
NS_OPT=-ORBInitRef NameService=corbaloc:iiop
>>> rbimporter.refresh()
```

The 'Text Editor' window shows the following Python code:

```
sim = uimanager.getView("OpenHRP")
for i in range(10):
    sim.startSimulation(0)
    sim.waitStopSimulation()
```

Red annotations highlight the 'Run' button, the 'Save' button, and the 'Text Editor' window.

④ Run

⑤ Display output on
JythonPrompt

③ Save

② Edit on **TextEditor**

4.Other Functions

Sample Script

All Items & Views are accessible through script

<Ex:> Simulation: Repeat execution

```
sim = uimanager.getView("OpenHRP")
```

```
for i in range(10):
```

```
    ... change settings...
```

```
    sim.startSimulation(0)
```

```
    sim.waitStopSimulation()
```

i=0: interactive

i=1: not interactive

4. Other Functions

Sample Script (Swing based)

```
from javax.swing import *
```

```
def act(evt):  
    print "punch!!!"
```

```
f = JFrame()  
c = f.getContentPane()  
c.add( JButton("Punch", actionPerformed=act) )  
f.setSize(200,200)  
f.setVisible(1)
```



4. Other Functions

Sample Robot Driven by Script

```
Def punch():
```

```
    seq.sendMessage(":joint-angles All_Joint_Angles time")
```

```
    seq.sendMessage(":joint-angles All_Joint_Angles time")
```

```
    ...
```

```
punch(seq)
```

