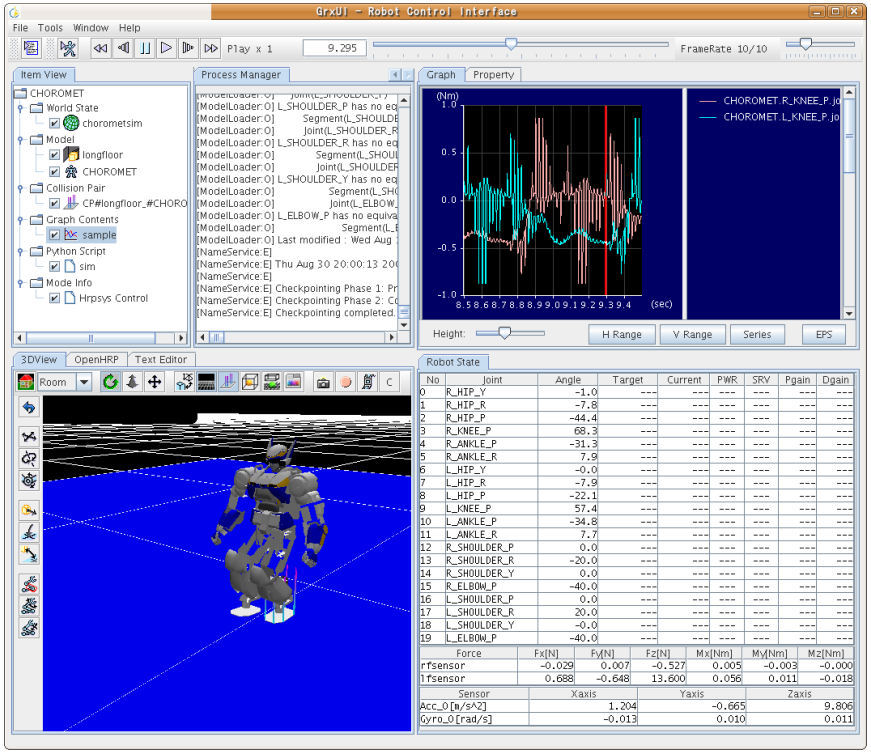
OpenHRP3 Course

How to use GrxUI



General Robotix, Inc

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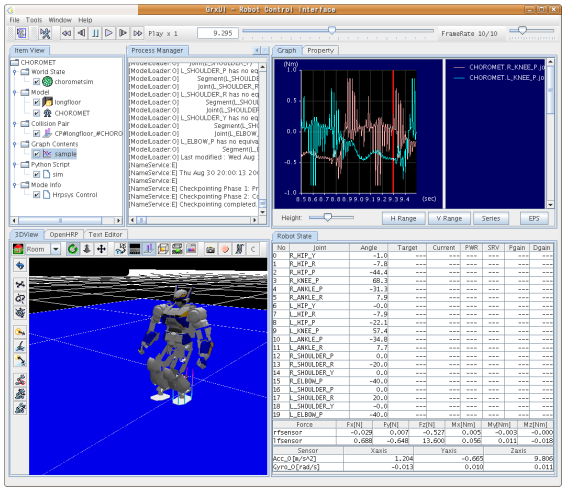
1. Overview on GrxUI
2. Sample Project Execution
3. Creating your own project
4. Other functions

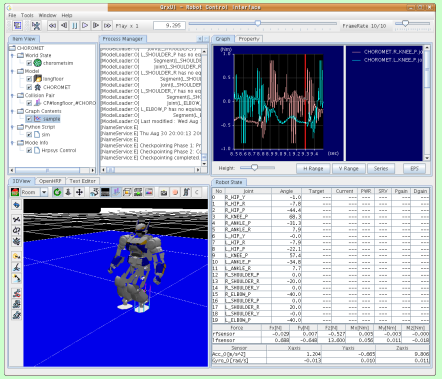


1.Overview on GrxUI

Basic functions of OpenHRP3

OpenHRP3

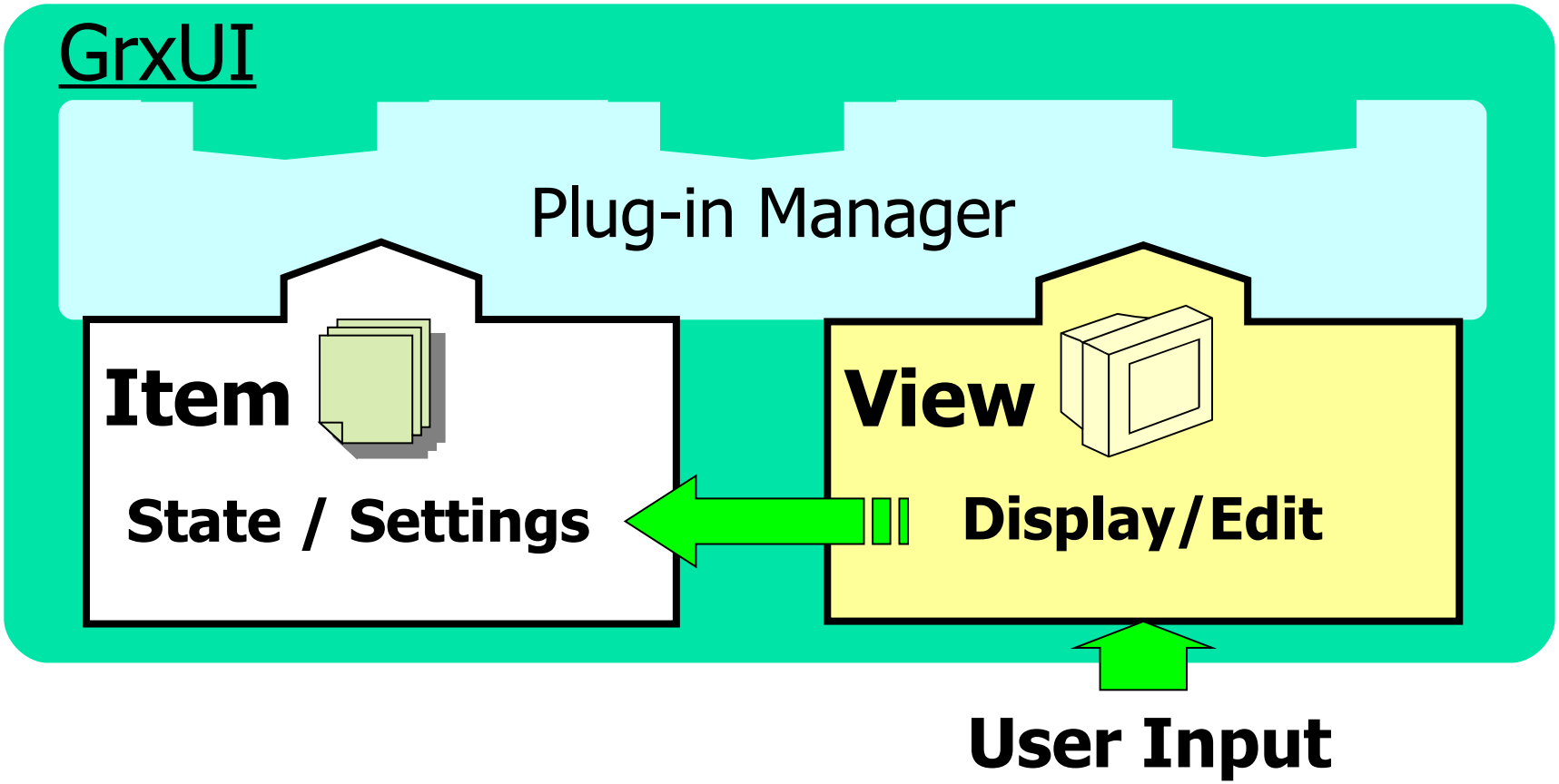
- **Model Loader**
- **Collision Detector**
- **Dynamics Simulator**
- **Robot Controller**



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

1.Overview on GrxUI

Plug-in extensions on functions



Example of Item

World State

World properties / Collision data log

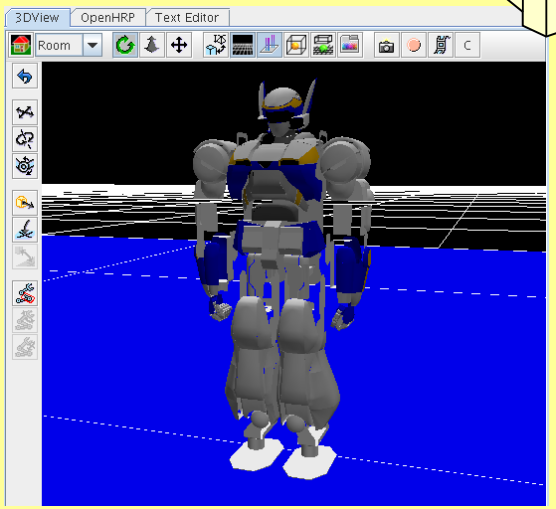
Model

Physical display model of Robot Environment

1.Overview on GrxUI

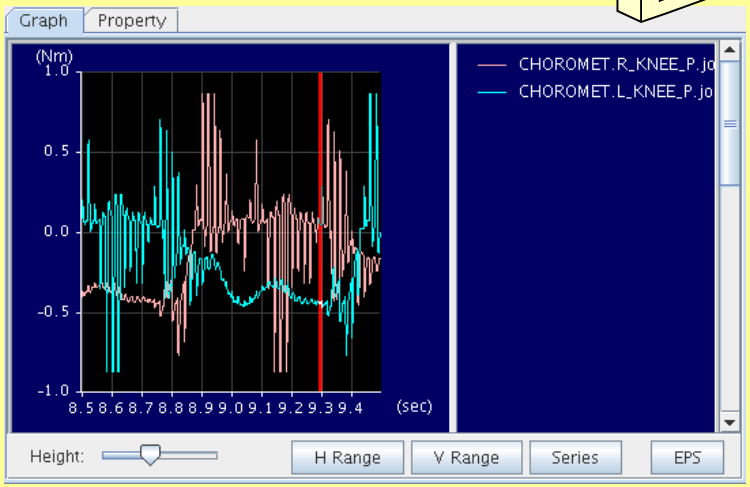
Example of View

3DView



- 3D Display/recording
- Initial settings

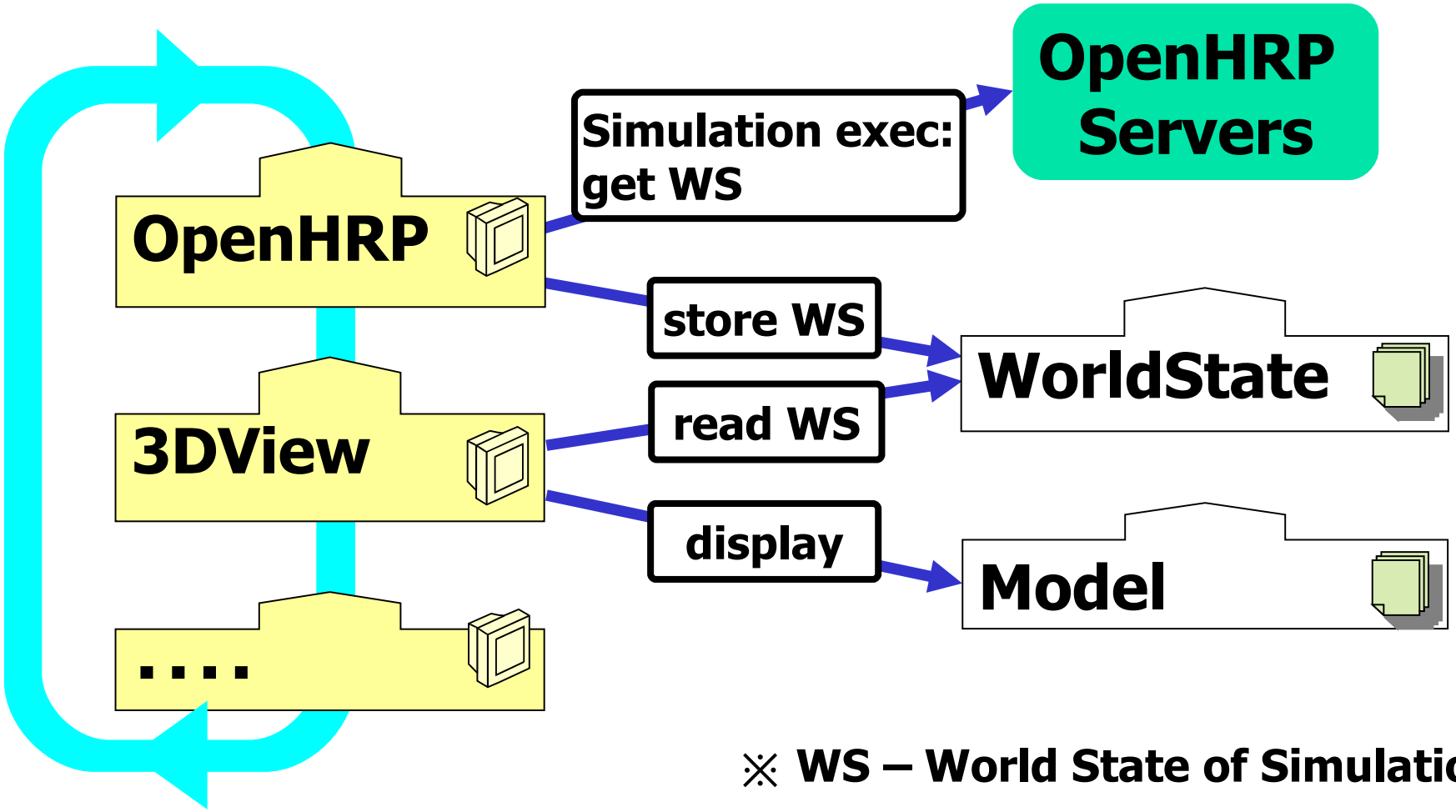
Graph



- Graph display
- Display settings

1.Overview on GrxUI

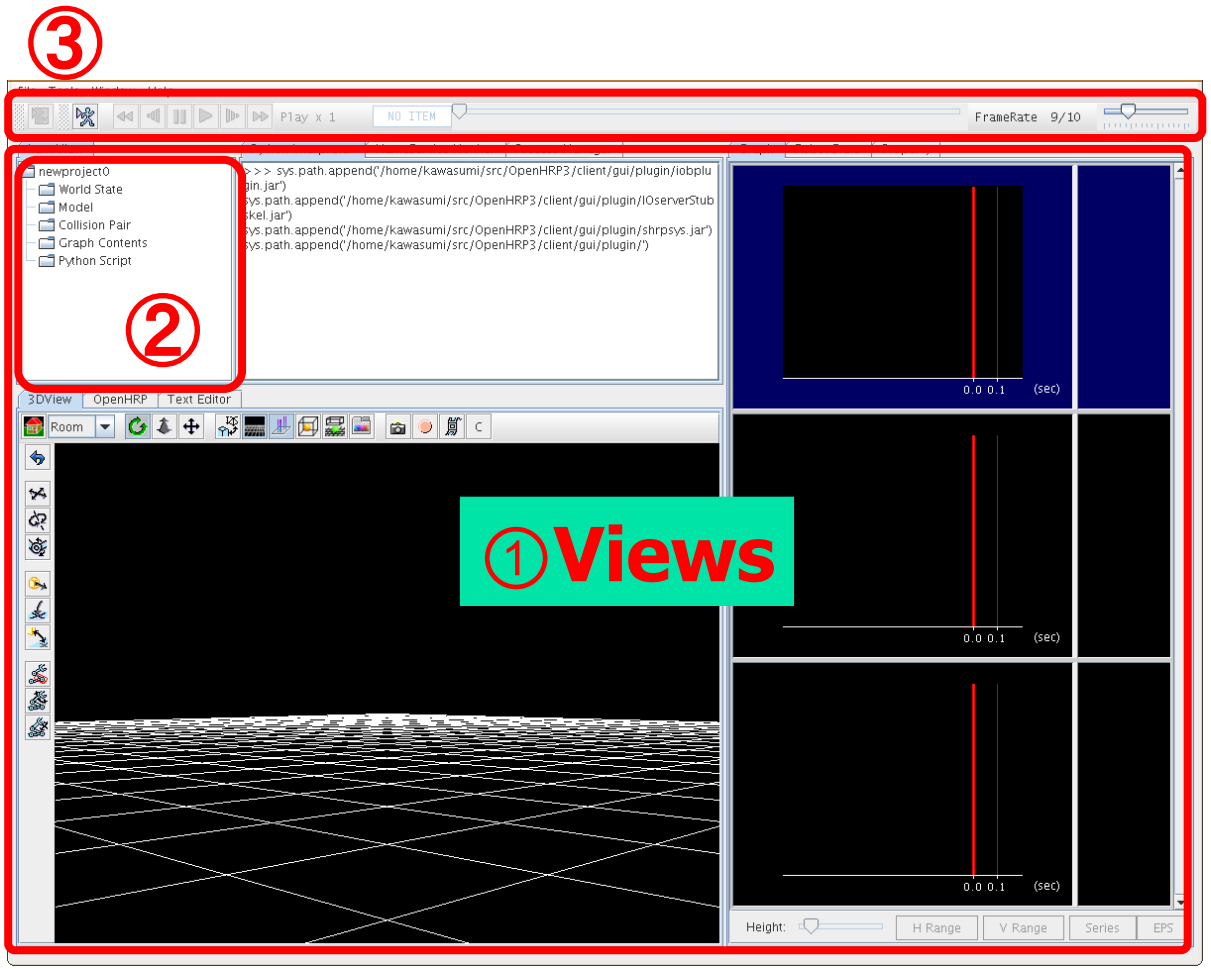
OpenHRP3 Execusion



※ WS – World State of Simulation

1.Overview on GrxUI

Interface Layout



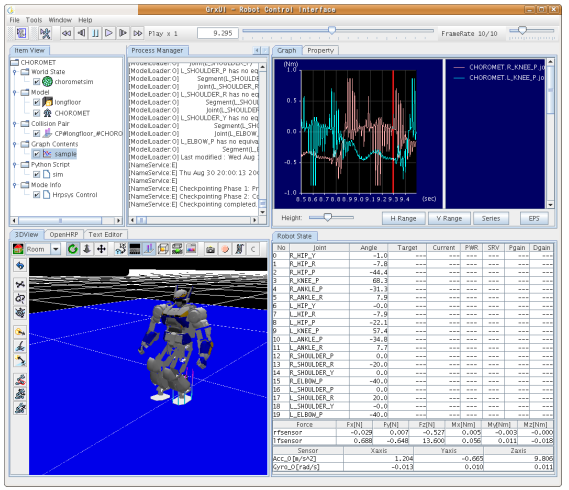
①**Views**
GUI panel of View

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

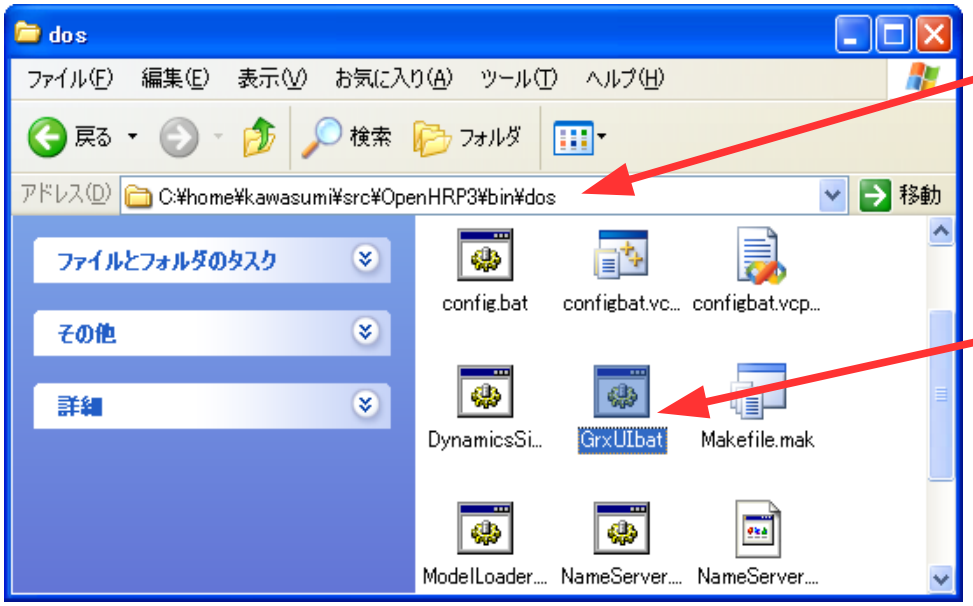


Describes the basic operations of GrxUI, by using a Sample Project.

2.Sample Project Execution

Starting GrxUI

On Windows



1. go to **OpenHRP3\bin\dos**

2.Double-click **GrxUI.bat**

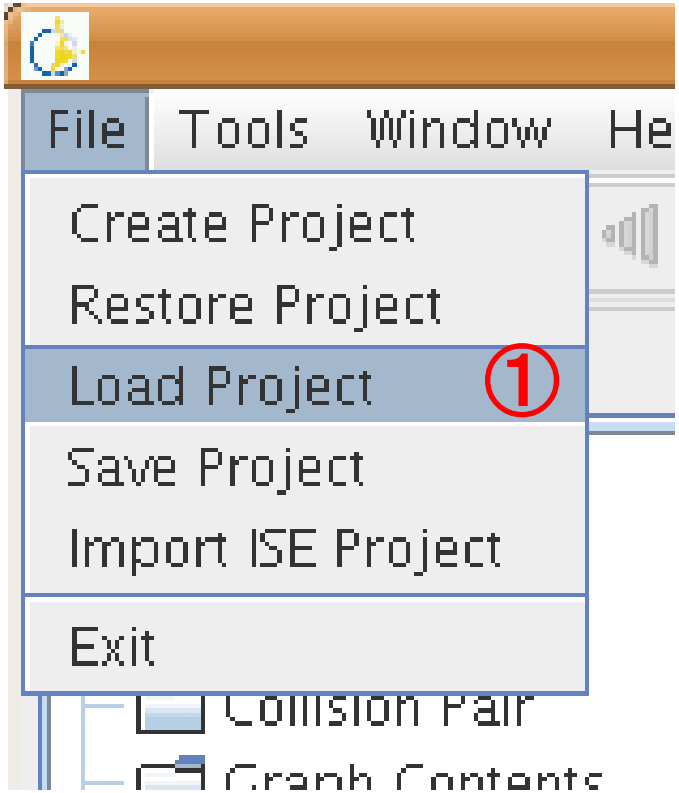
On Linux

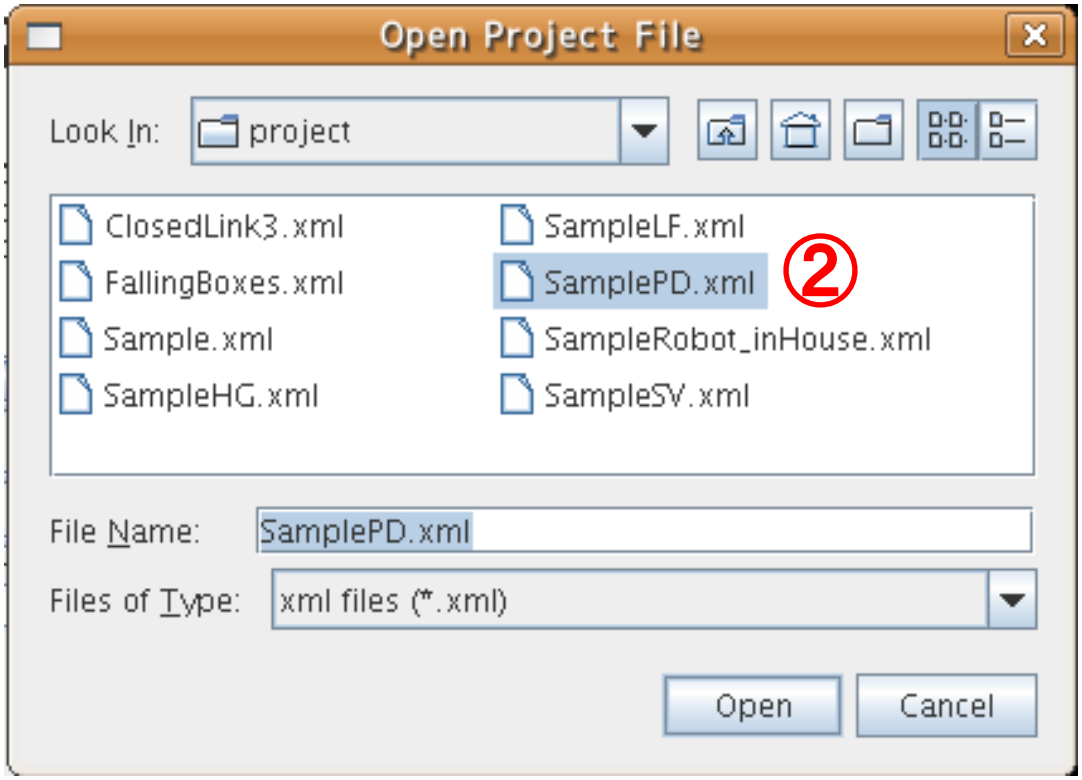
```
$ cd <OpenHRP3 Home dir:>/bin/unix
$ ./GrxUI.sh
```

2.Sample Project Execution

Loading Sample Project

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

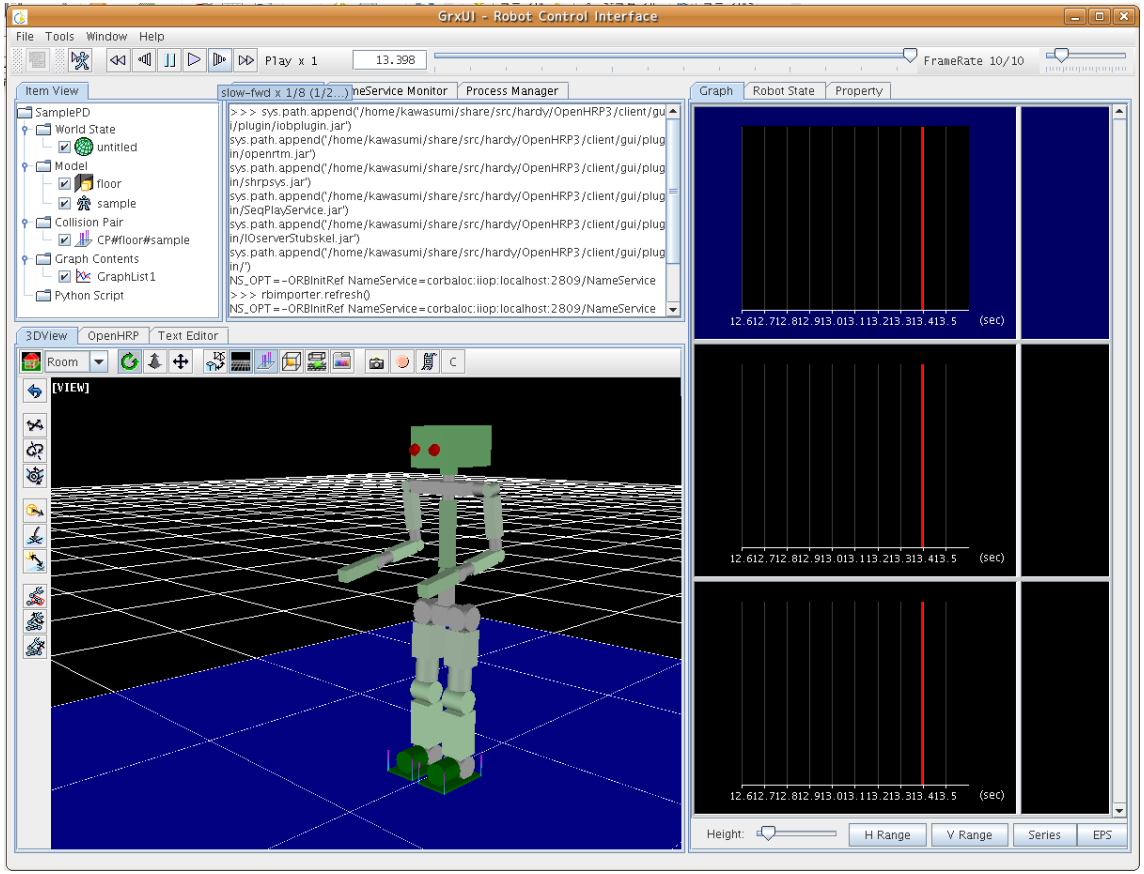




2.Sample Project Execution

SamplePD.xml

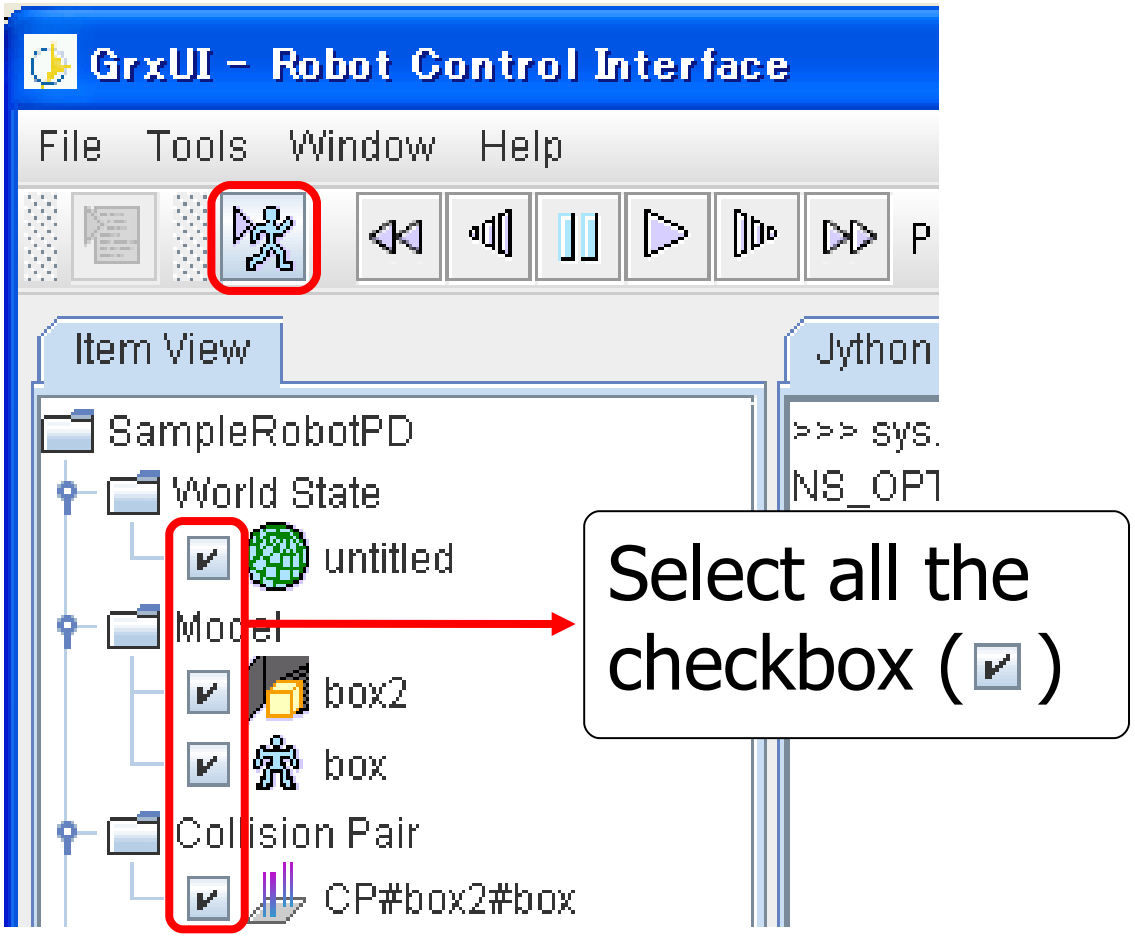
Walking simulation of a sample robot



2.Sample Project Execution

Start Simulation

Press 'Start Simulation' button ( )



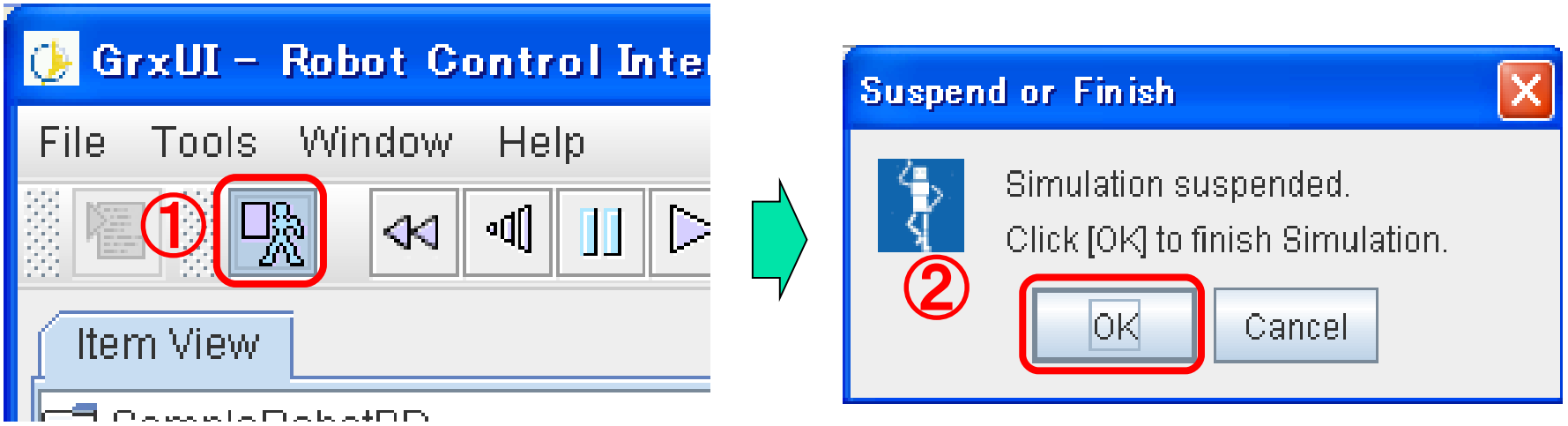
2.Sample Project Execution

Suspend/Finish Simulation

To Finish the simulation process, during execution...

① Press 'Suspend Simulation' button

② [OK] : Finish [Cancel] : Continue



2.Sample Project Execution

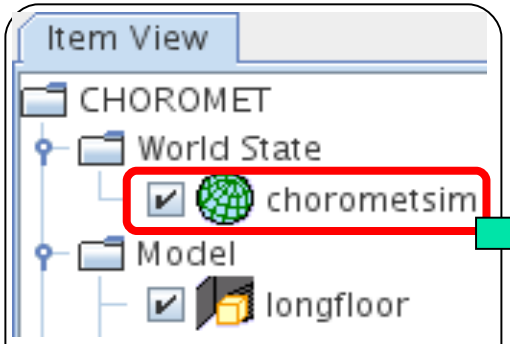
Playback Function

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

Playback Toolbar

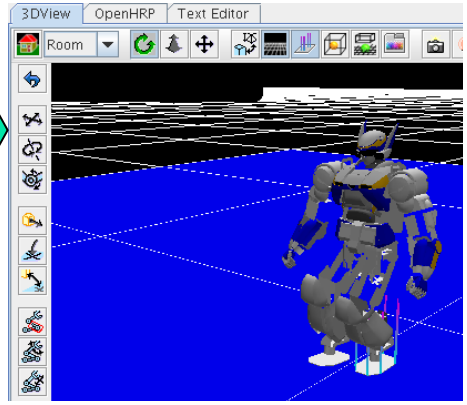
TimeSlider

FrameRate Slider

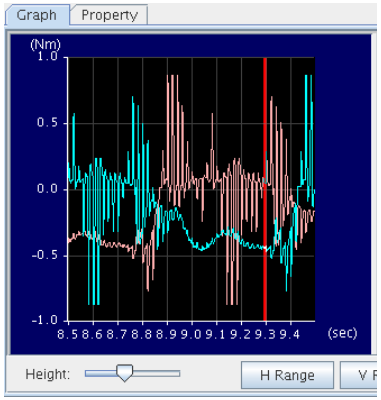


Save the results in World State

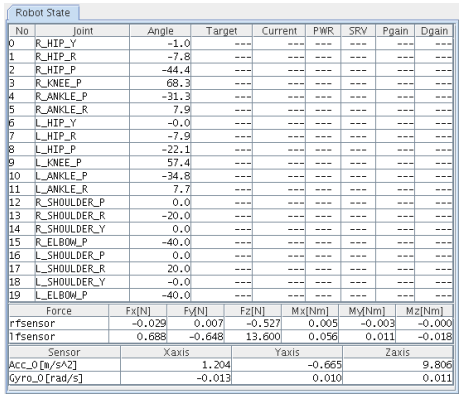
3DView



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
lfsensor	0.688	-0.648	13.600	0.056	0.011	-0.018

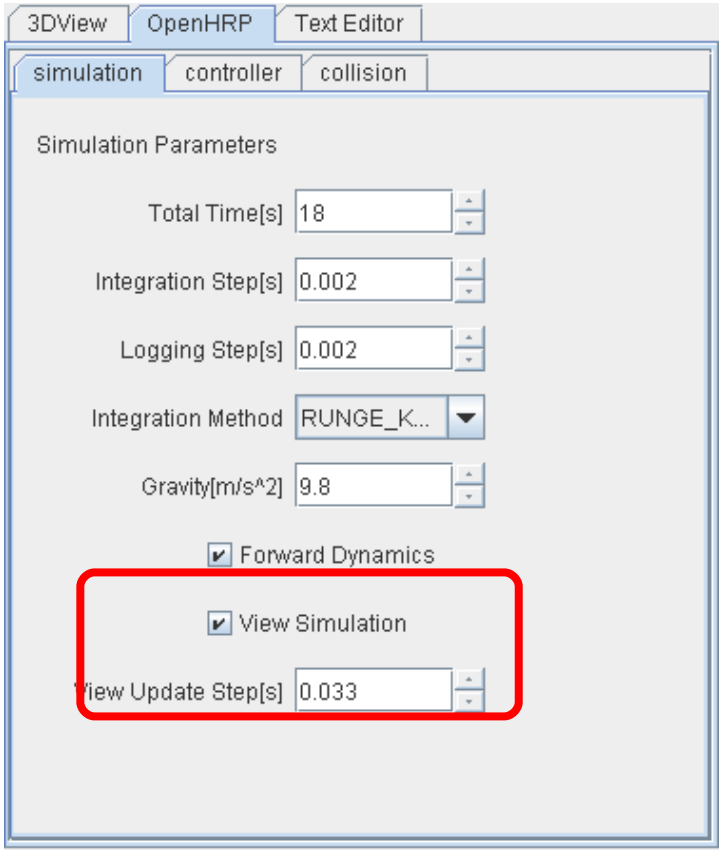
Sensor	Xaxis	Yaxis	Zaxis
Acc_0[m/s^2]	1.204	-0.665	9.806
Gyro_0[rad/s]	-0.013	0.010	0.011

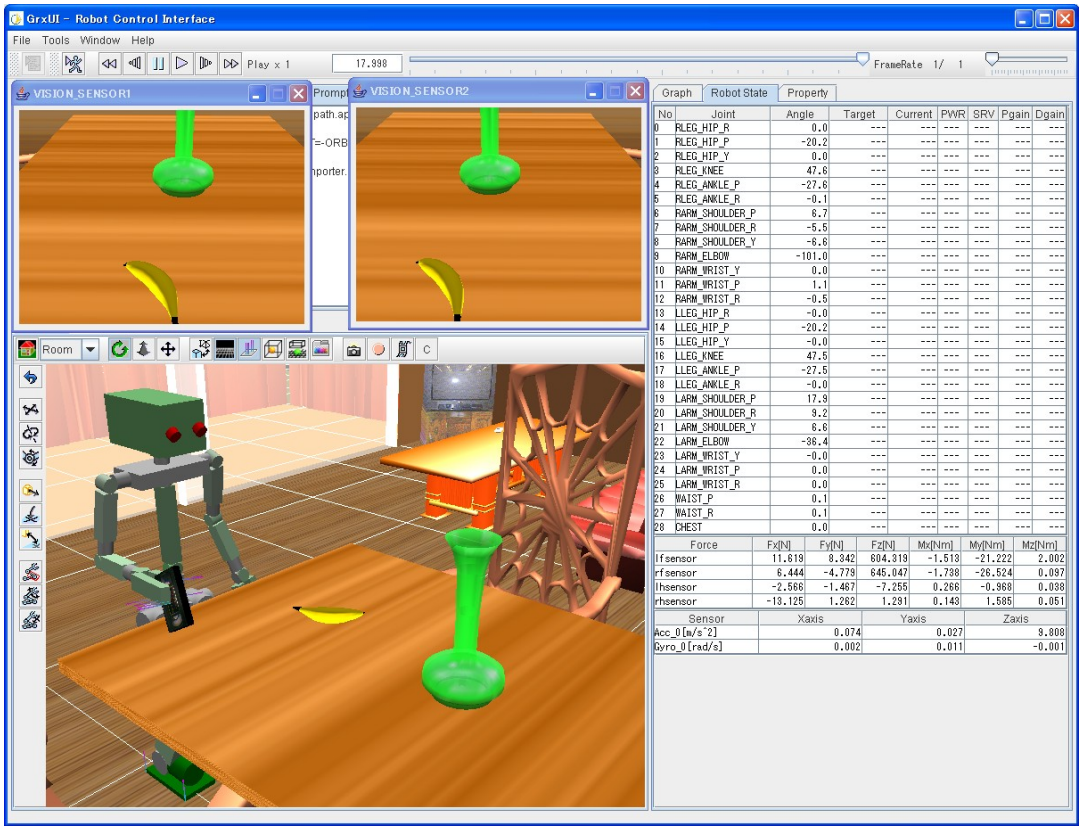
Display the WorldState at time, that TimeSlider indicates

2.Sample Project Execution

ViewSimulation Function

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

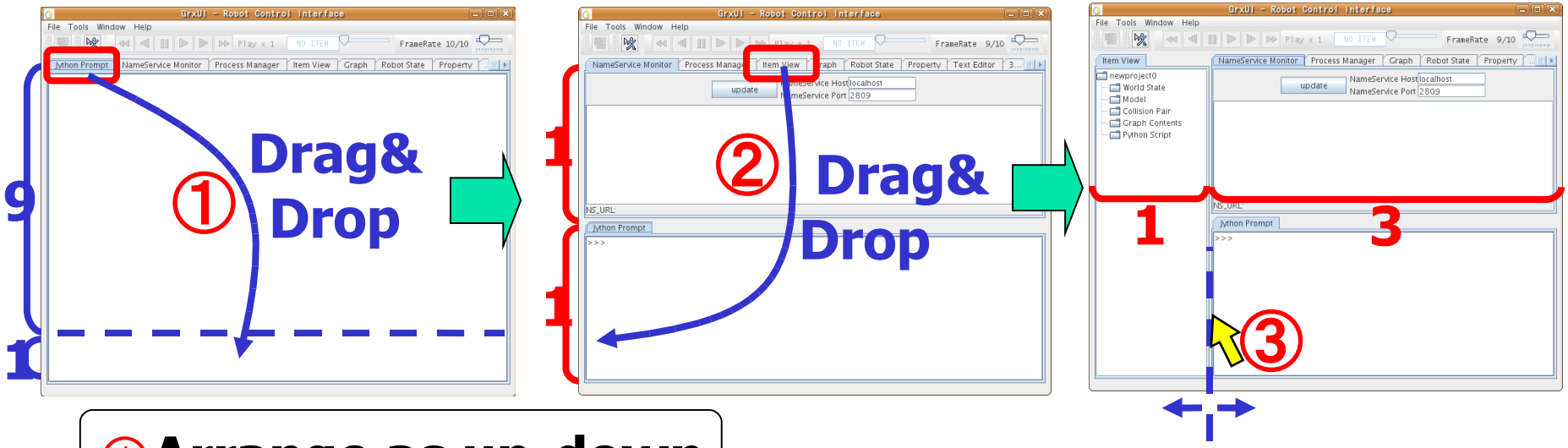




2.Sample Project Execution

Customize Interface Layout(1)

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



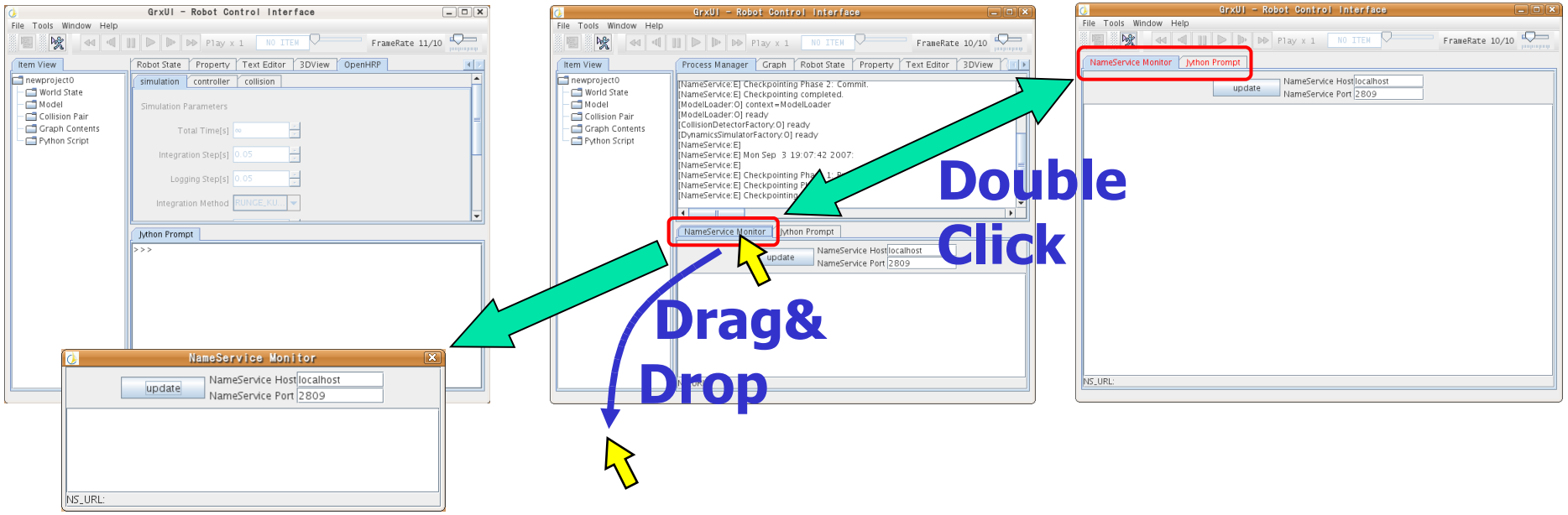
①**Arrange as up-down or left-right panels**

③**Hold on separator and drag to fine-align**

2.Sample Project Execution

Customize Interface Layout(2)

Double Click to maximize

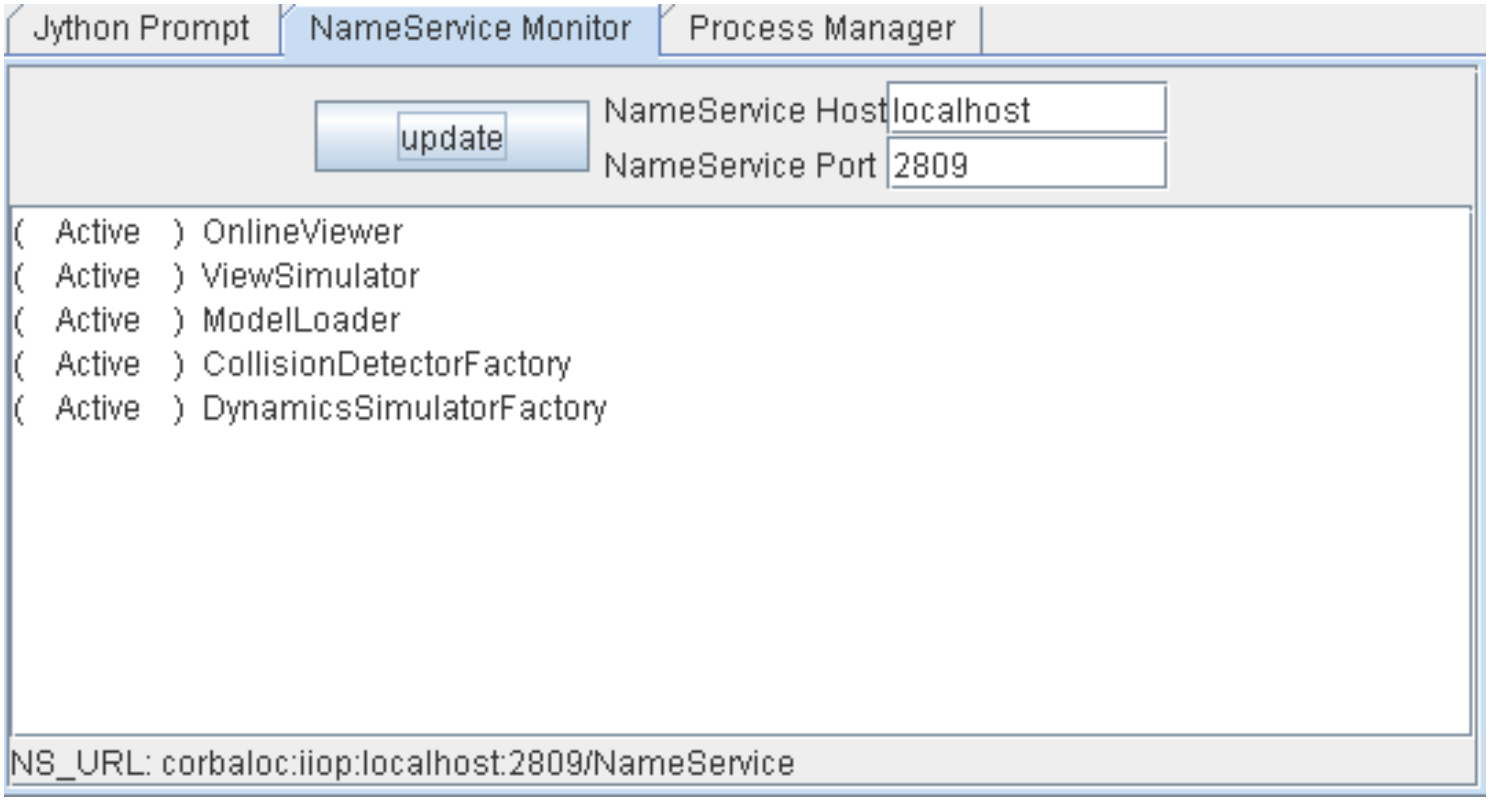


Drag&Drop out the panel to pop-out as Window

2.Sample Project Execution

NameService Monitor View

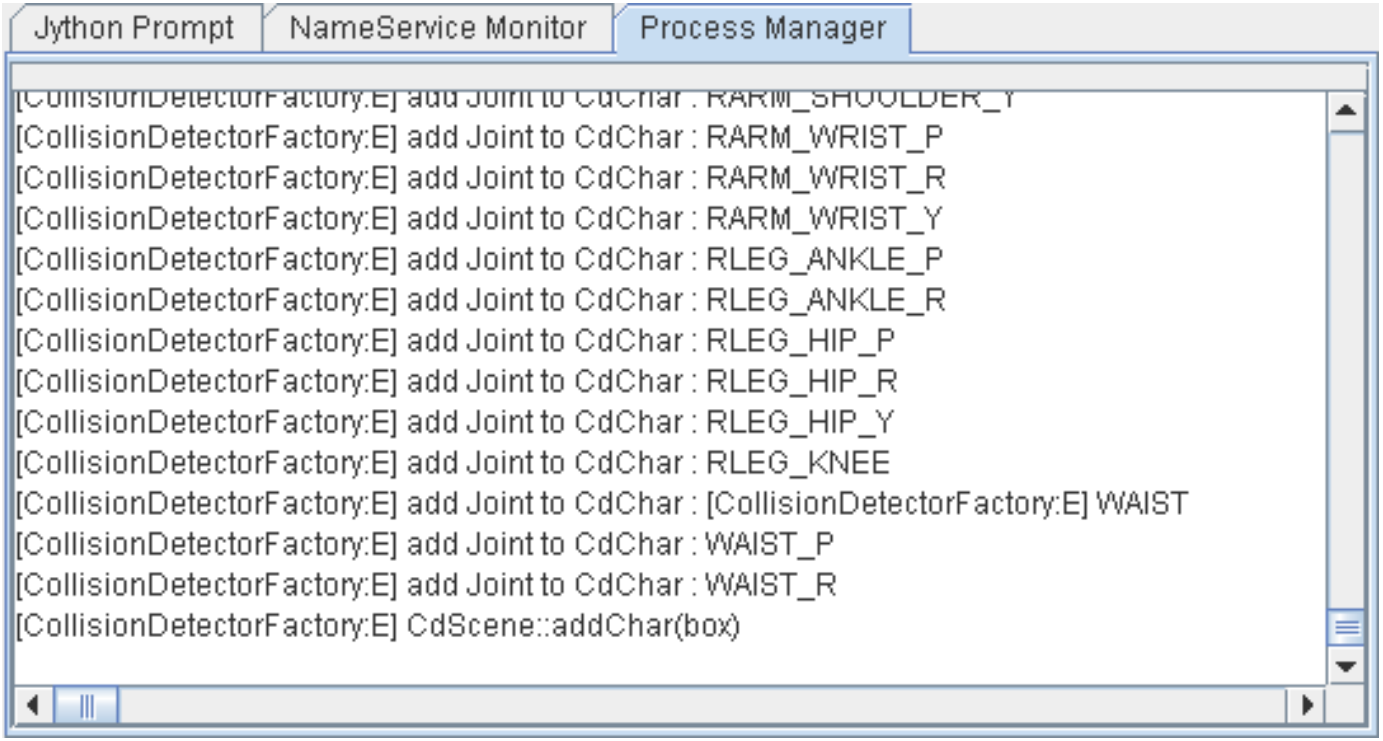
Display the Name list registered with CORBA NameService



2.Sample Project Execution

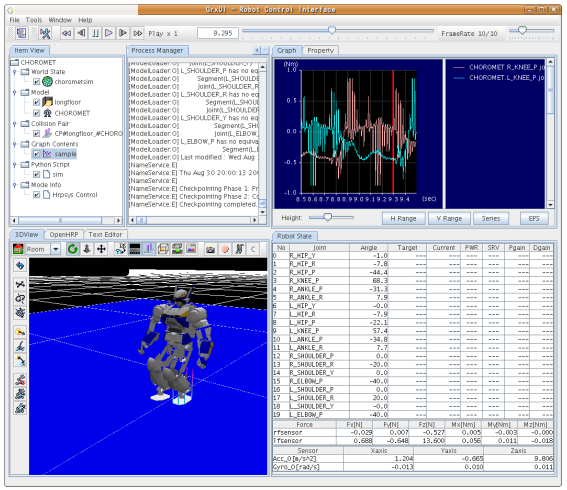
Process Manager View

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



Next...

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



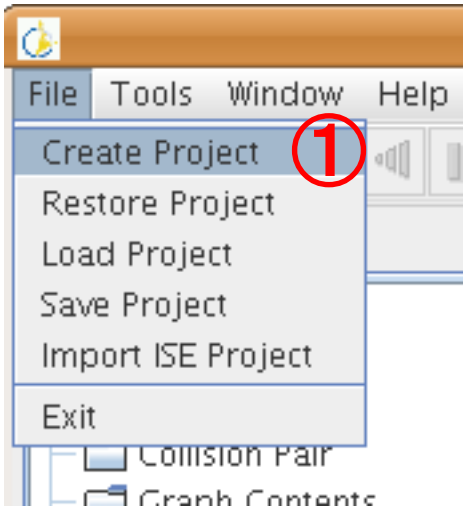
Here we describe, creating a project similar to *OpenHRP3/client/gui/project/SamplePD.xml*

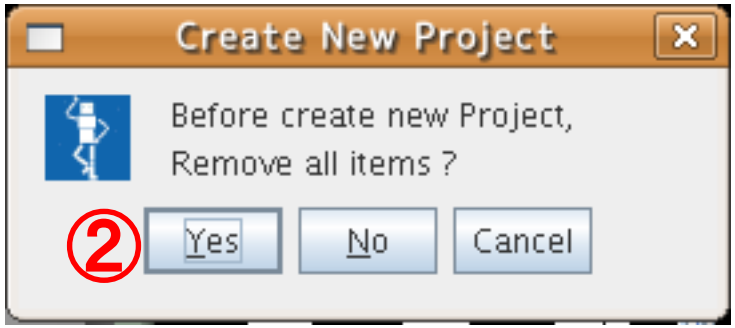
3.Creating your own project

Creating a Project

①Select '**File**' > '**Create Project**'

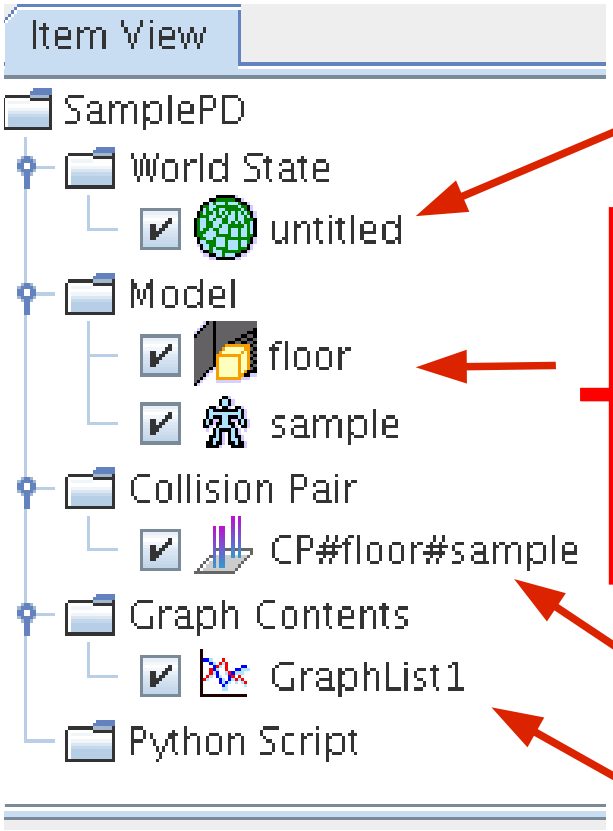
②Select 'Yes' in the displaying dialog box, to remove all current items





3.Creating your own project

Procedure



1.Environment configuration

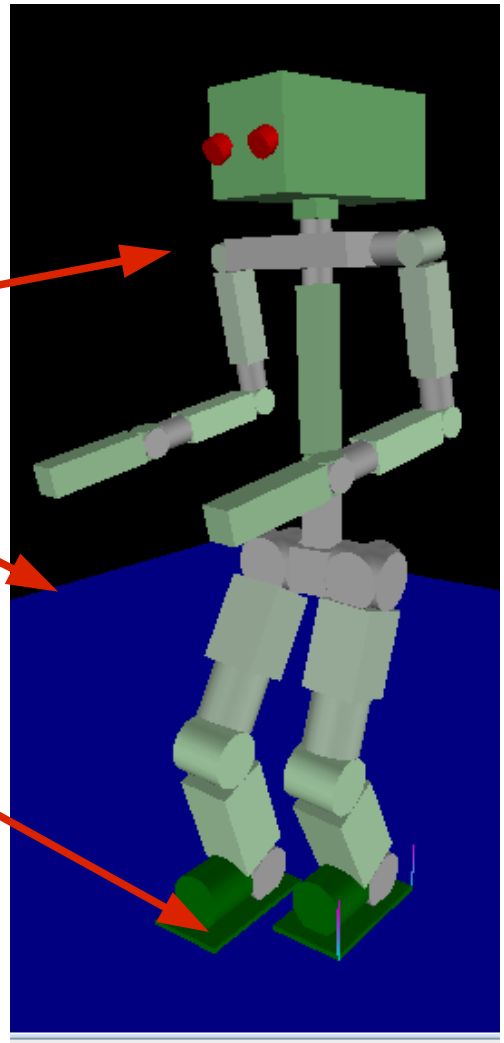
2.Load Model

3.Initial posture settings

4.Controller Settings

5.Collision Detector settings

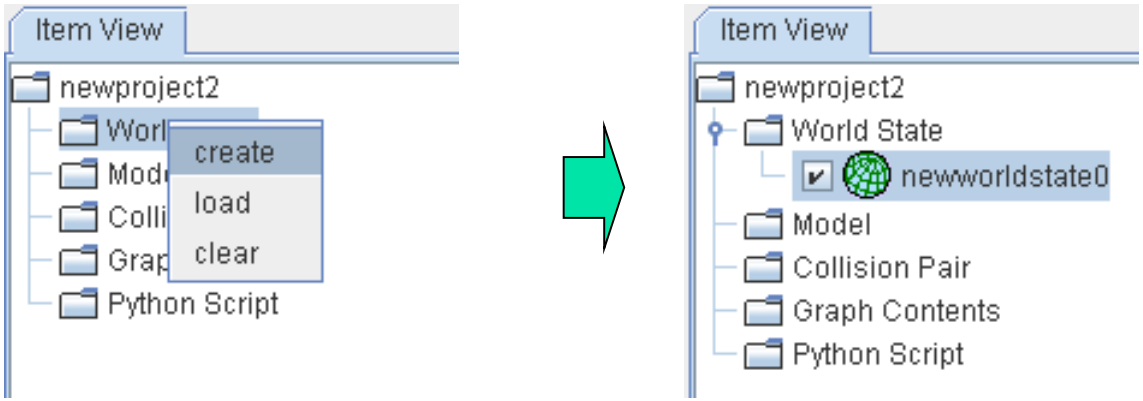
6.Graph settings



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

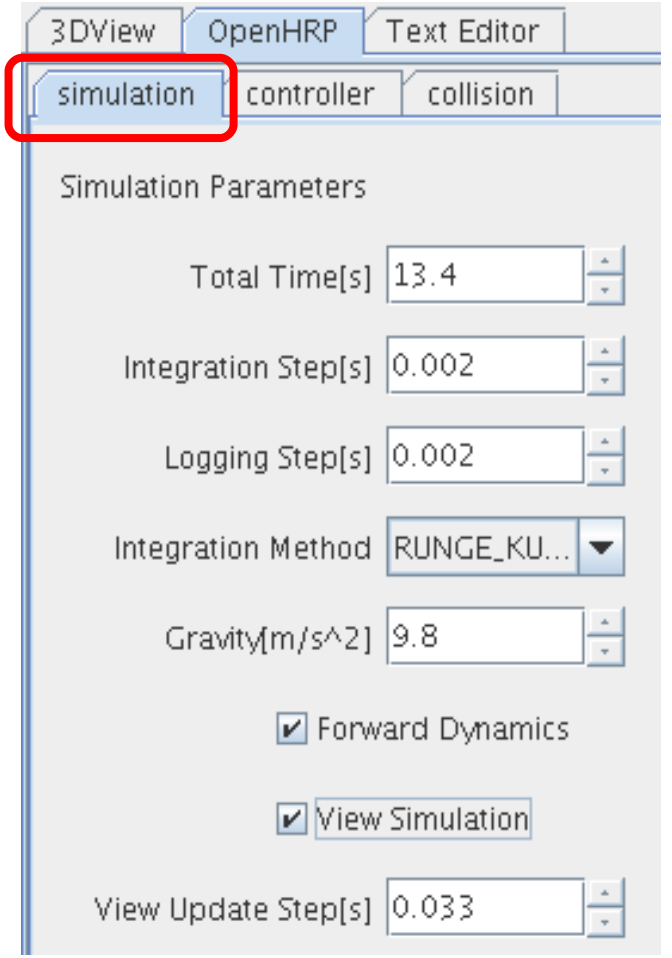
Logging period : 0.001

Integration algorithm: RUNGE_KUTTA

Gravity : 9.8

Forward Dynamics : ON

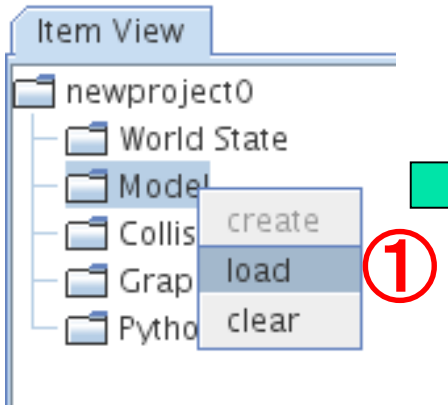
ViewSimulation : ON

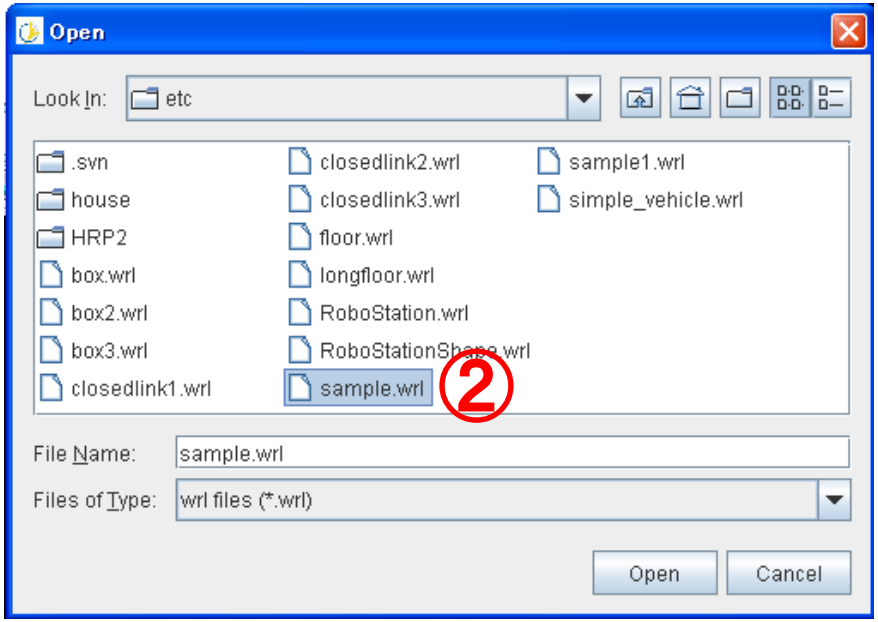


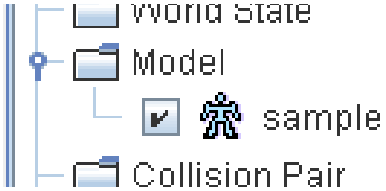
3.Creating your own project

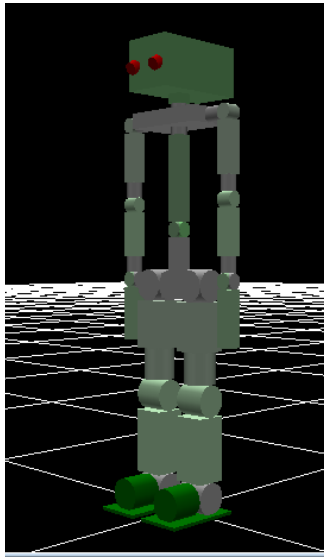
Loading Robot Model

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







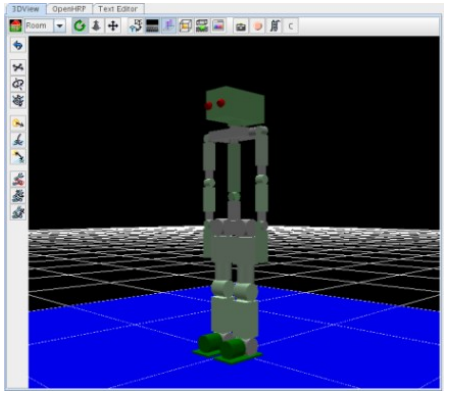


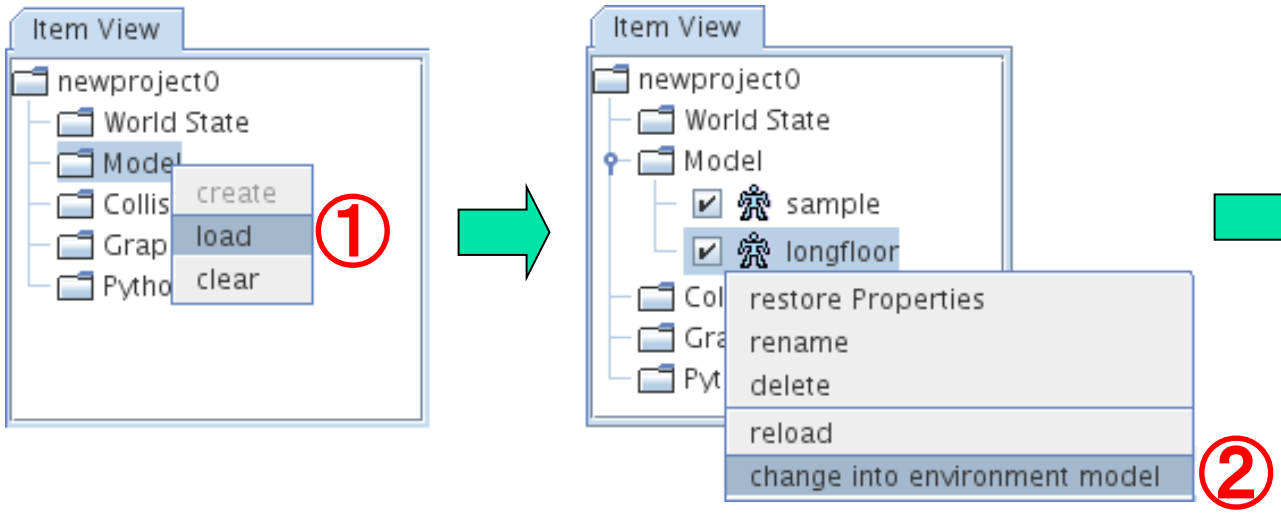
3.Creating your own project

Loading Environment Model

① Load 'longfloor.wrl' as same as robot model

② Right-click on 'longfloor' and select 'change in to environment model'





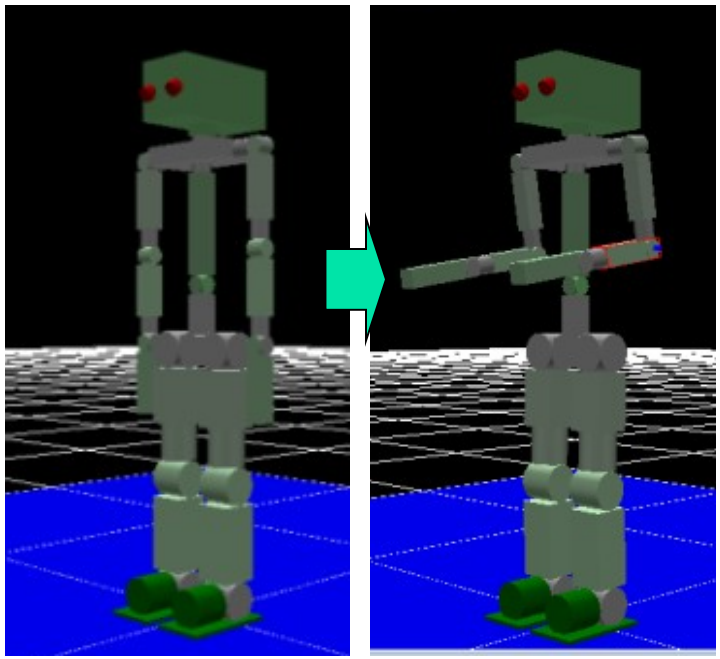
3.Creating your own project

Model Initial Settings (sample)

Property View

Graph | Property

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_ELBOW.angle	-1.57

(**Radian**)

3.Creating your own project

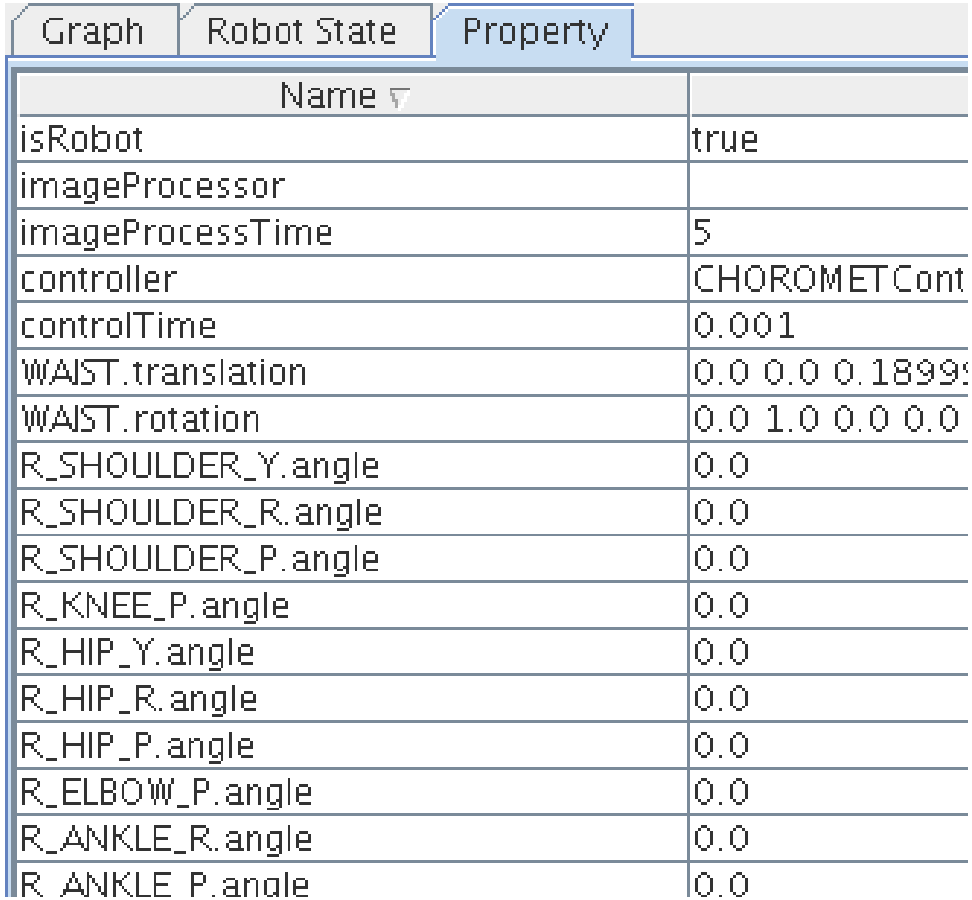
Model Initial Settings (1)

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)

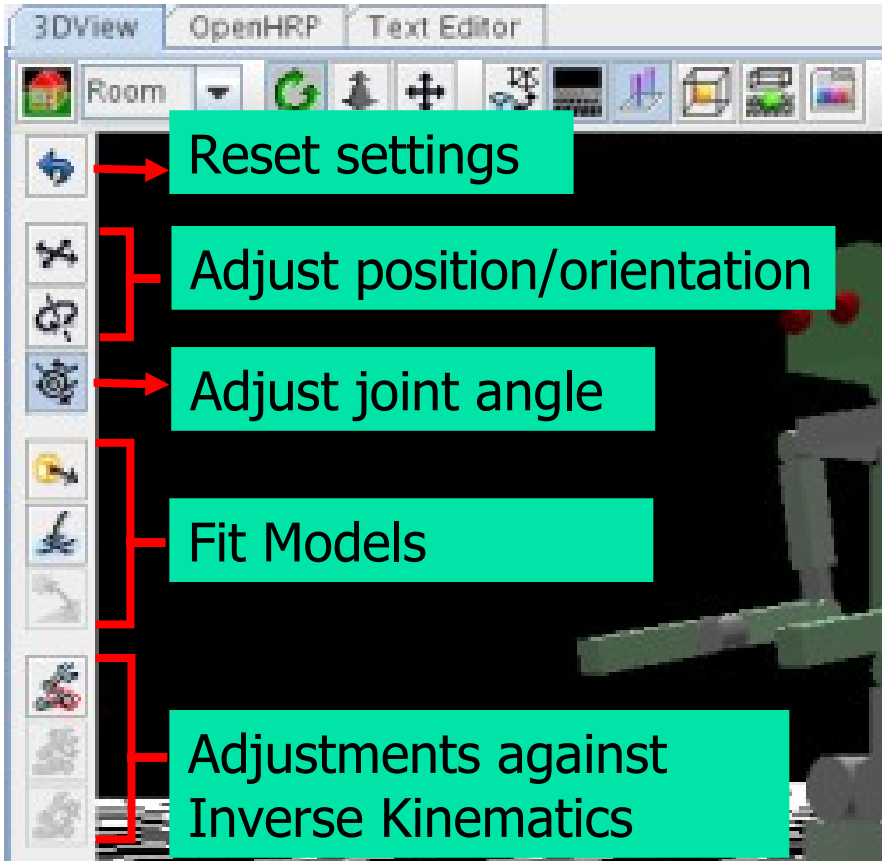
JOINT_AXIS.angle
Joint Angle in **[rad]**



3.Creating your own project

Model Initial Settings (2)

3DView



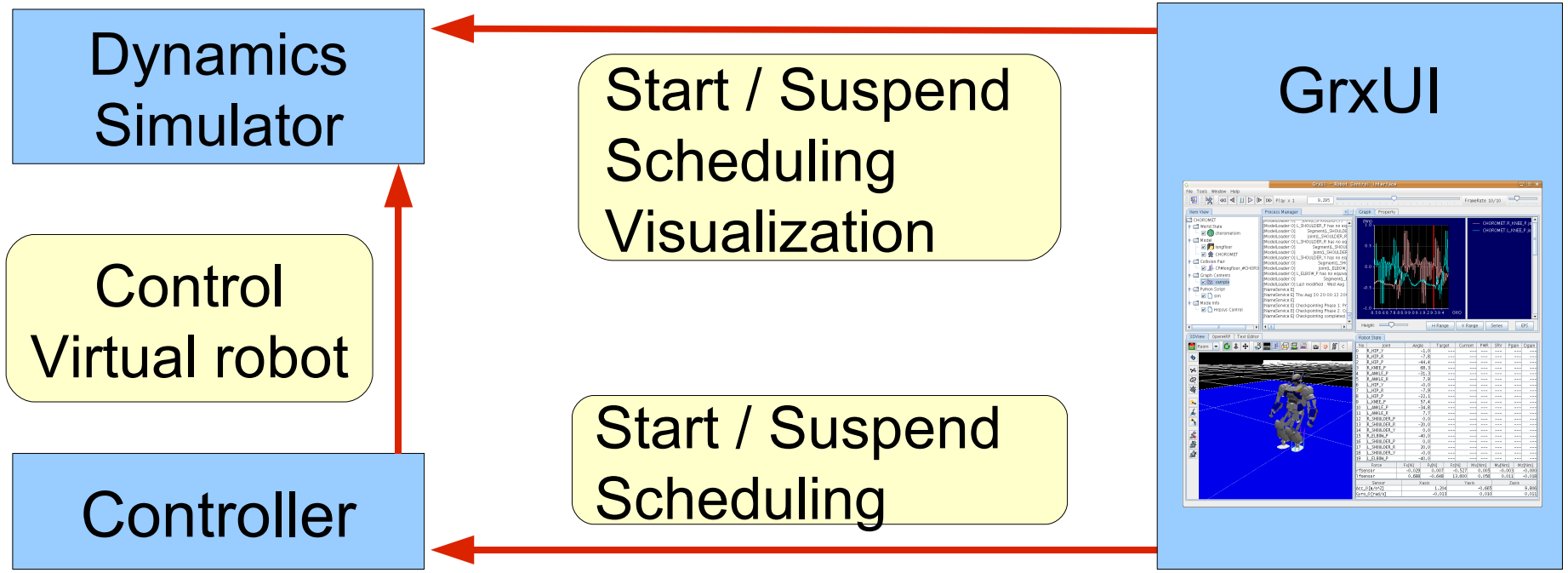
Robot State View

Graph | Robot State | Property

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	L				---	---	---	---
16	L				---	---	---	---
17	L				---	---	---	---
18	L				---	---	---	---
19	L				---	---	---	---
20	L				---	---	---	---
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	---	---	---	---	---	---

Display Current Joint Angle

3.Creating your own project
Controller



Project : SamplePD.xml

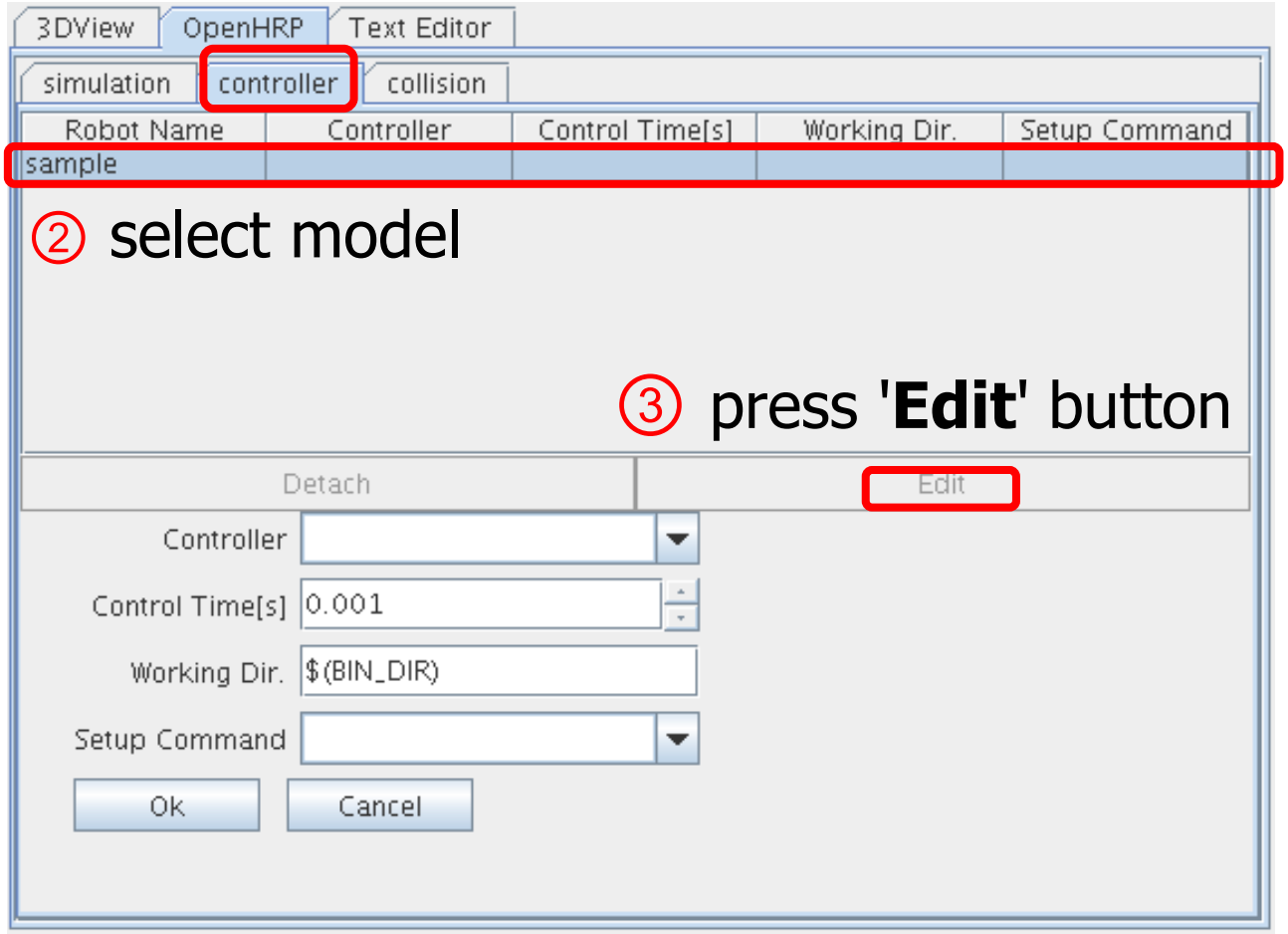
Path: OpenHRP/Controller/rtc/SamplePD/SamplePD.sh

CORBA ID: SamplePDController

3.Creating your own project

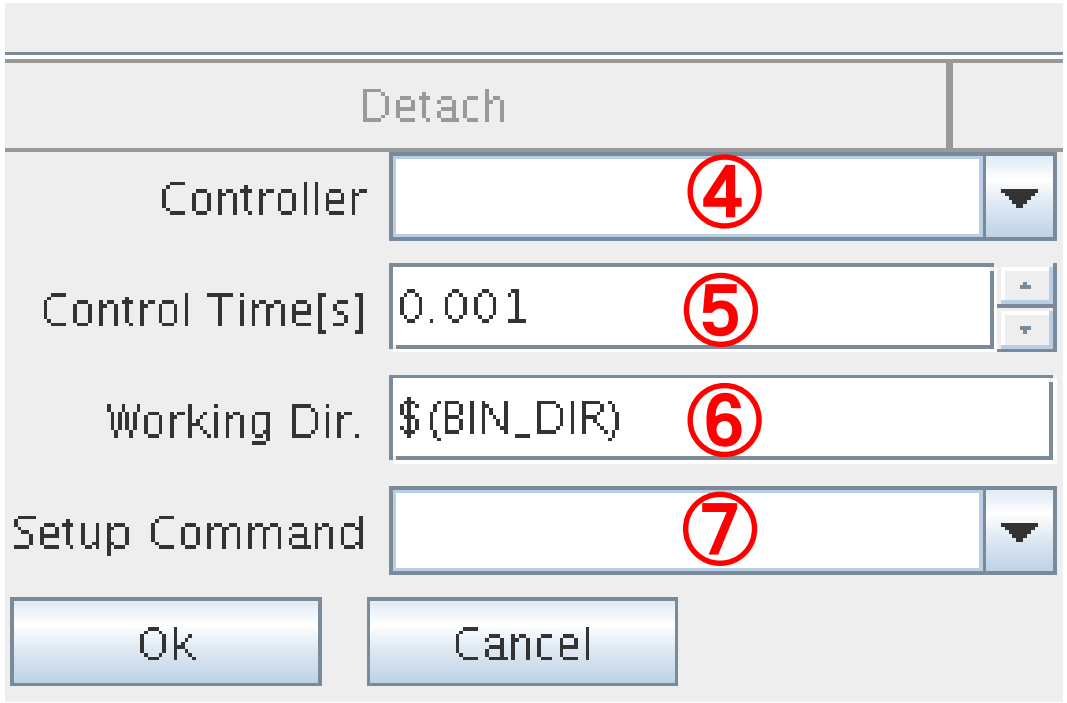
Controller Settings (1)

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



3.Creating your own project

Controller Settings (2)



④ CORBA Id
Ex：SamplePDController

⑤ Controller cycle
Ex：0.002

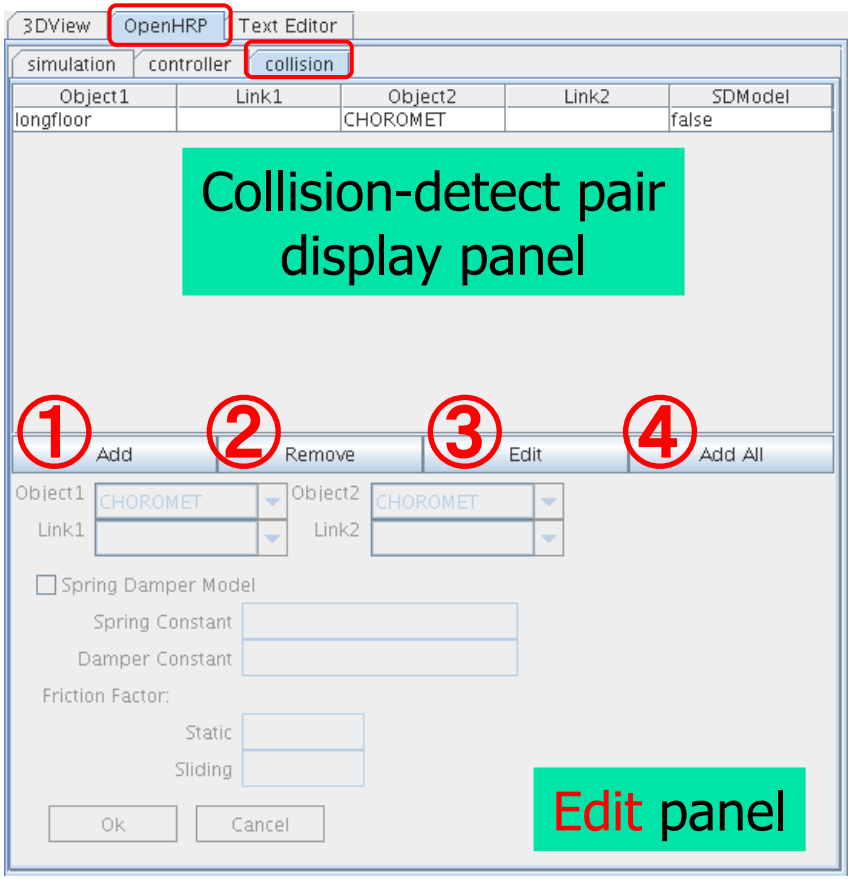
⑥ Working directory
Ex：$(OPENHRPHOME)/
Controller/rtc/SamplePD/

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

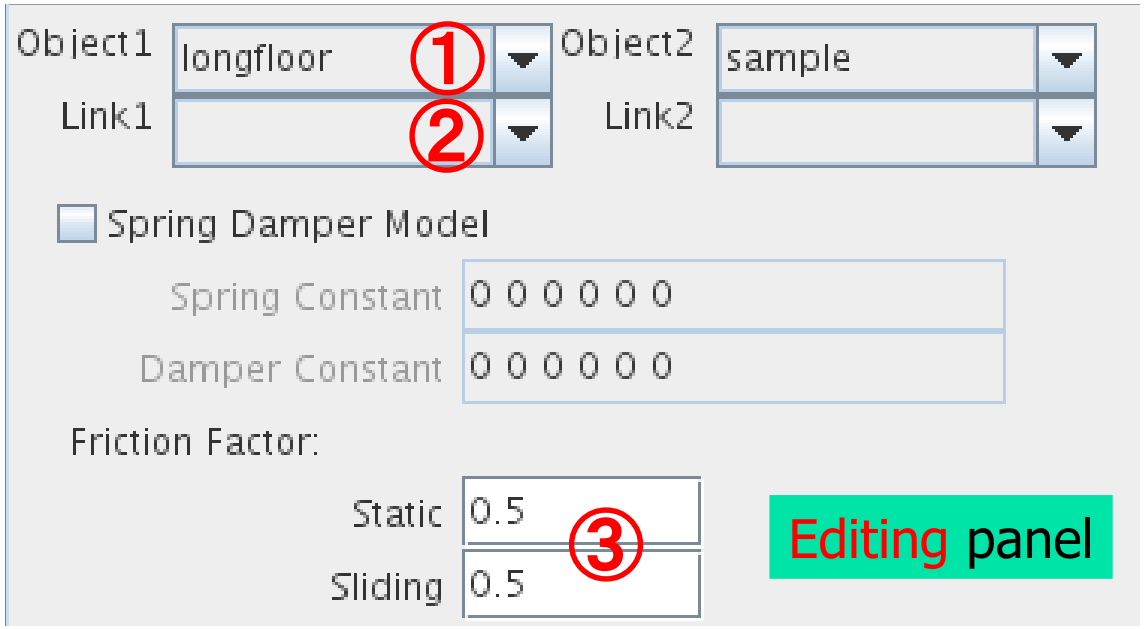
Collision-detect pair (2)

Editing Collision-detect pair

① **Object1/2**
- Select model
- Becomes active when newly creating a pair, using Add button

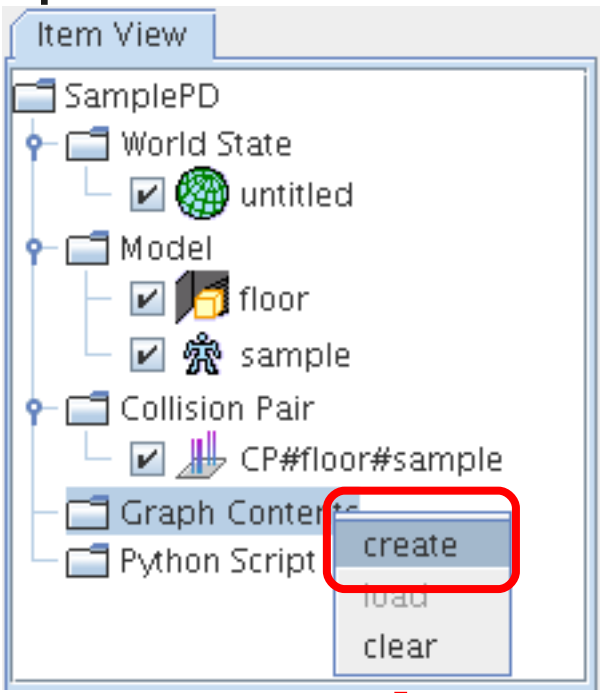
② **Link1/2**
- Select Link
- skip, intended for all links

③ **Friction Factor**
- set Friction Factor

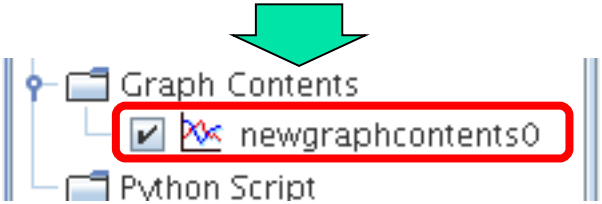


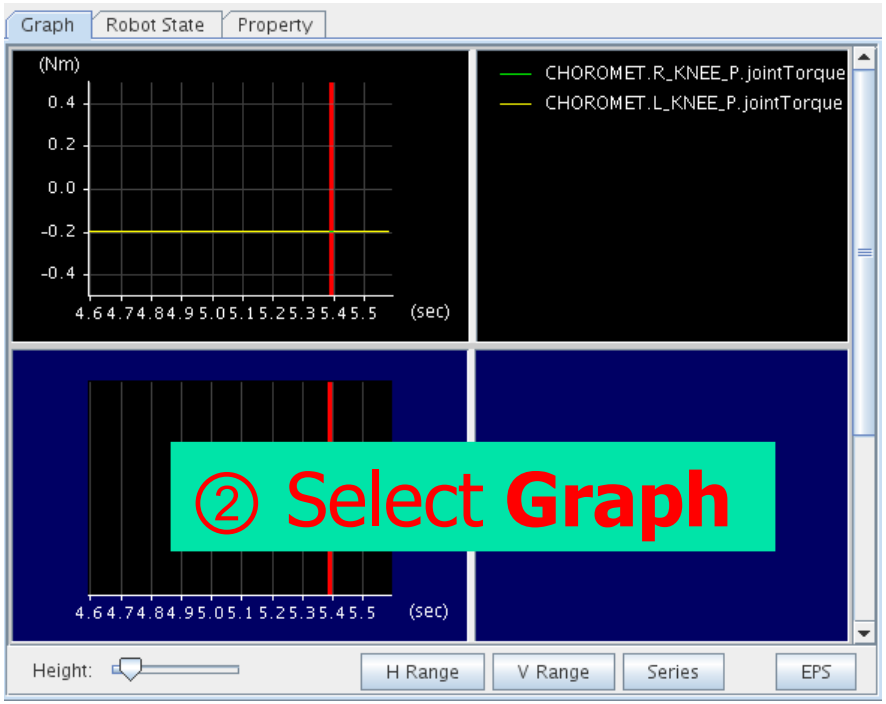
3.Creating your own project

Graph Content Settings (1)



①create **Graph Contents**



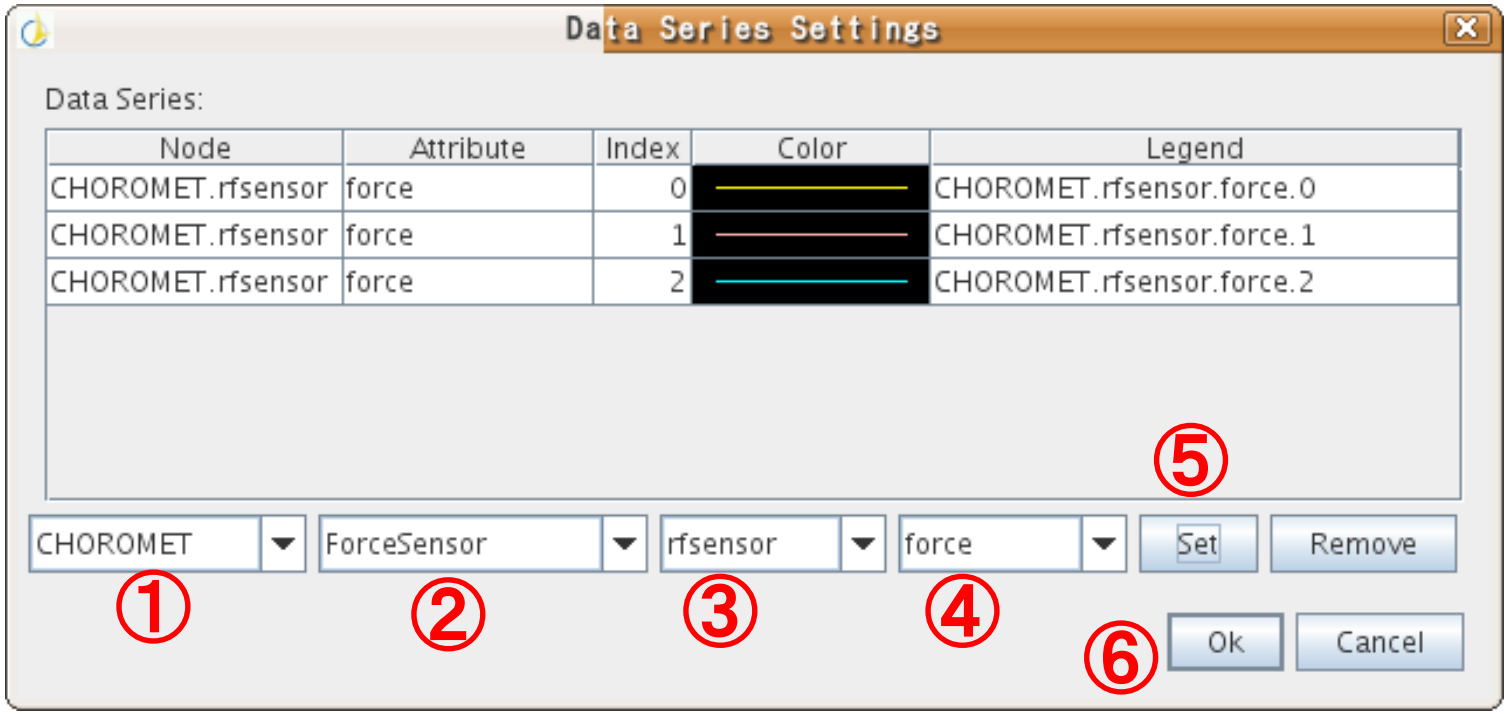


③ press '**Series**' button

3.Creating your own project

Graph Content Settings (2)

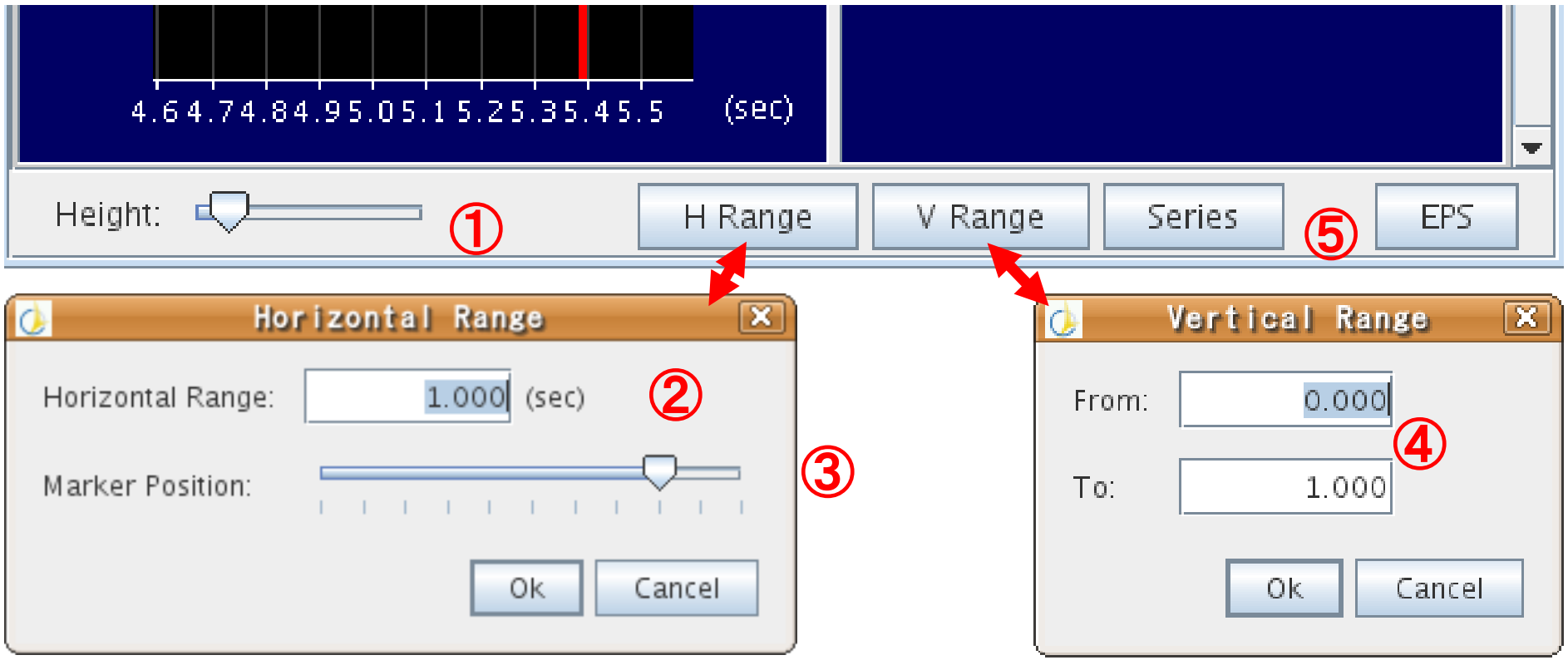
① Select robot name
② Select Sensor type
③ Select Node name
④ Select Attribute
⑤ press **Set**
⑥ press **OK**



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

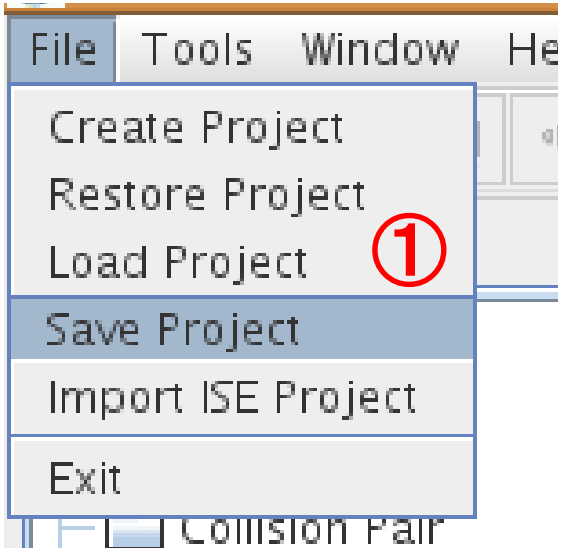
① Select 'File' -> 'Save Project' and save as 'SampleTest'

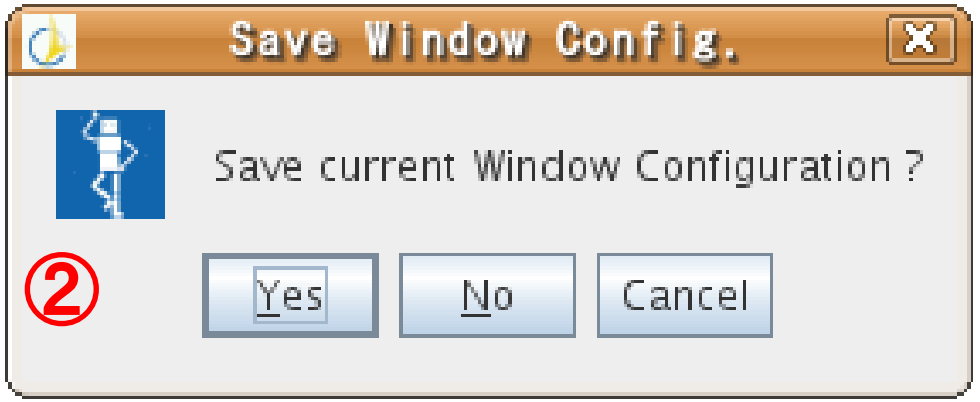
② 'Save Window Config.' dialog box

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>
    ...
```

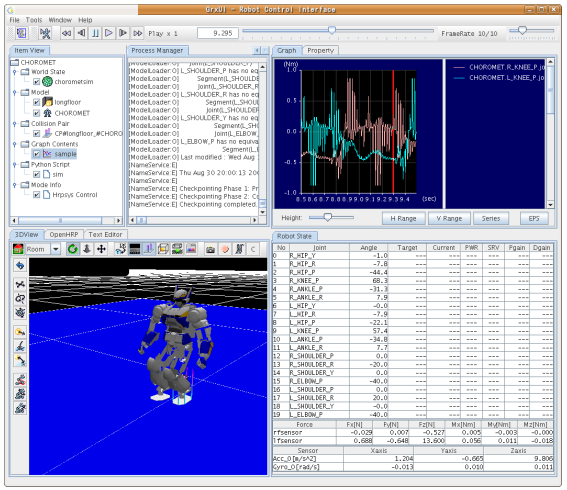
View Settings

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

Window Configuration

Next...

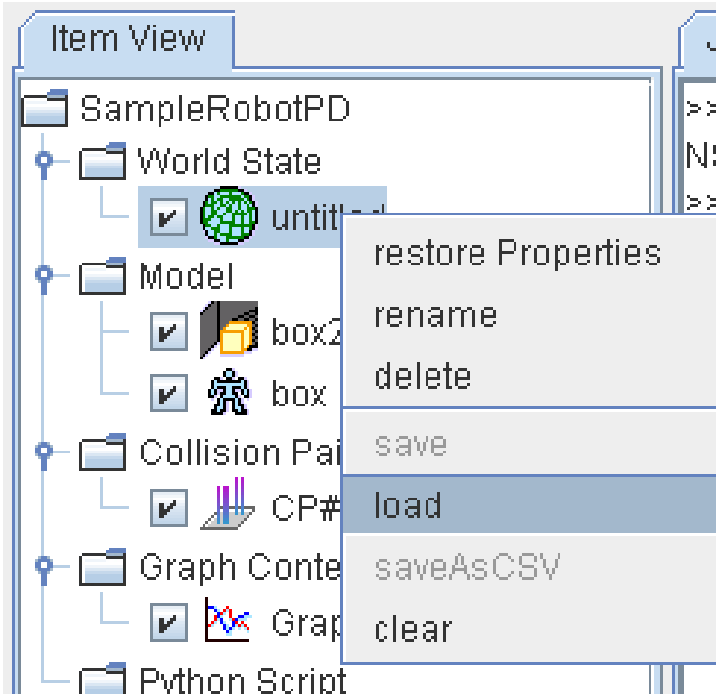
1. Overview on GrxUI
2. Sample Project Execution
3. Creating your own project
4. Other functions



4.Other Functions

Save/Load Simulate Results

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



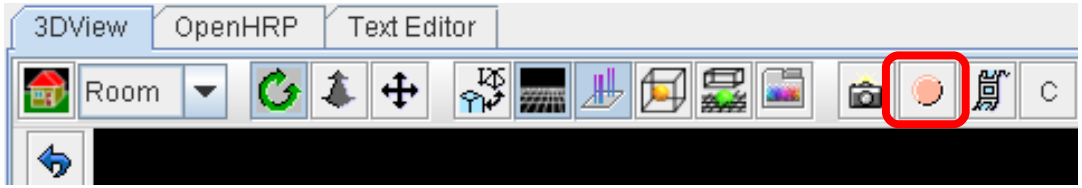
Save as
'client/gui/log/untitled.log'

4.Other Functions

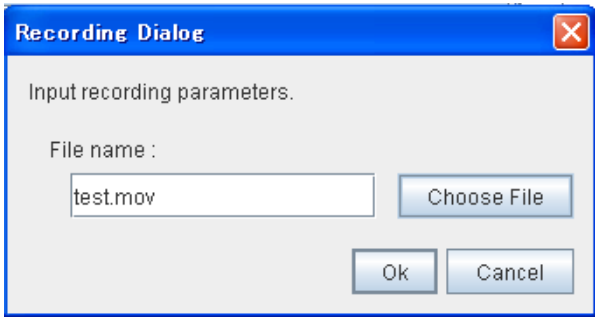
Movie Recording

① set to 33

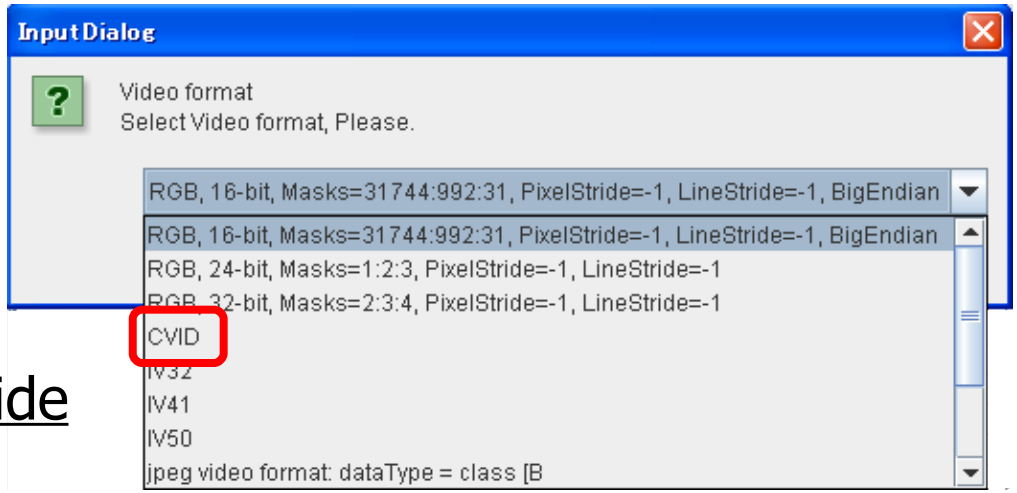
② press 'record' button



③ Choose saving location



④ Select Video format



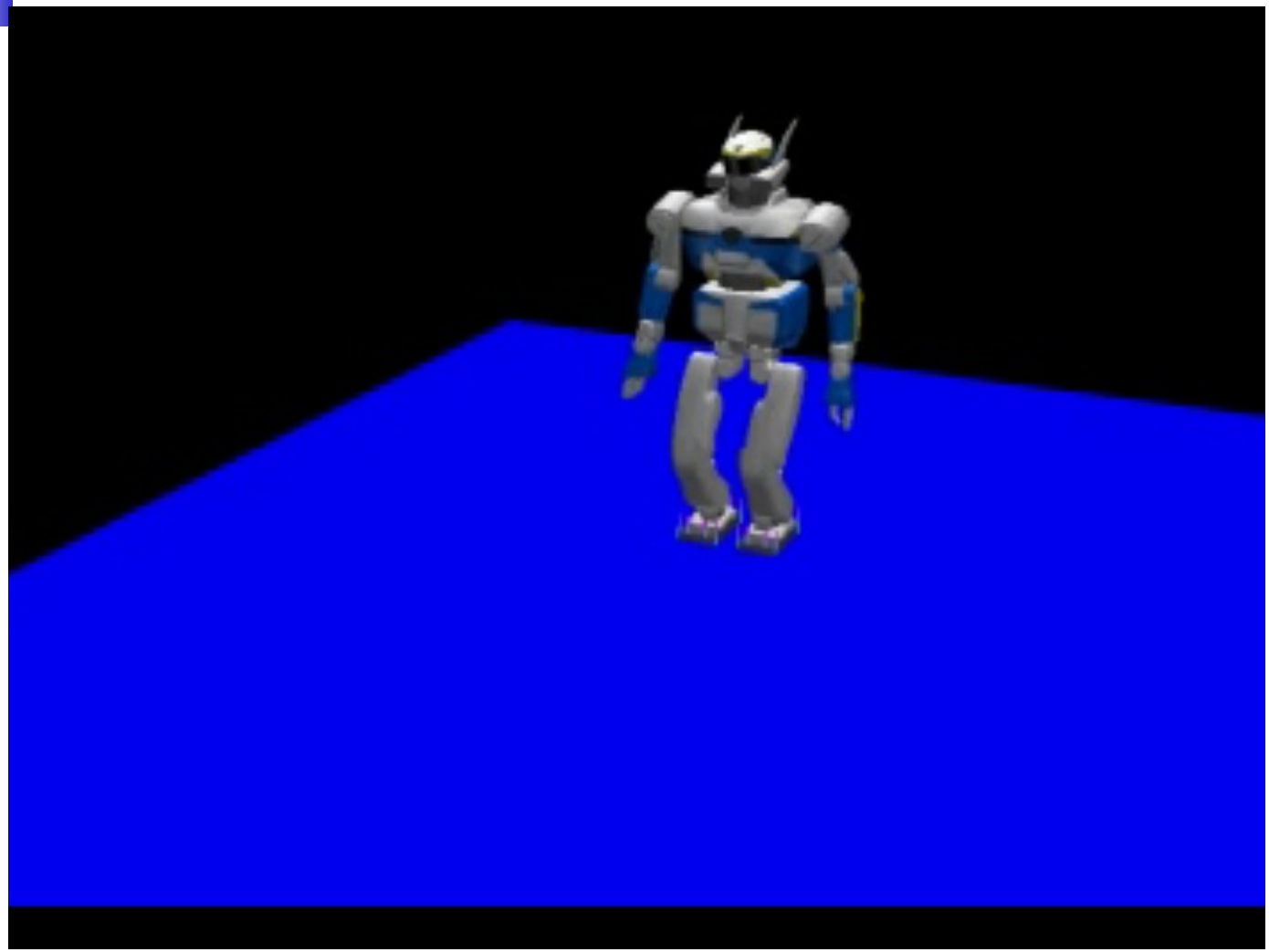
<u>To attach on **PowerPoint** slide</u>

Windows : Select **CVID**

Linux : keep with default settings,
convert to mpeg using **TMpegEnc**+**QTReader**

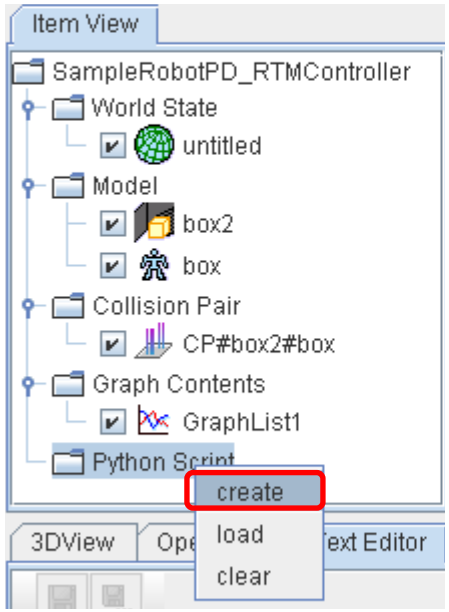
4.Other Functions

Movie Recording (sample)

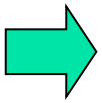


4.Other Functions

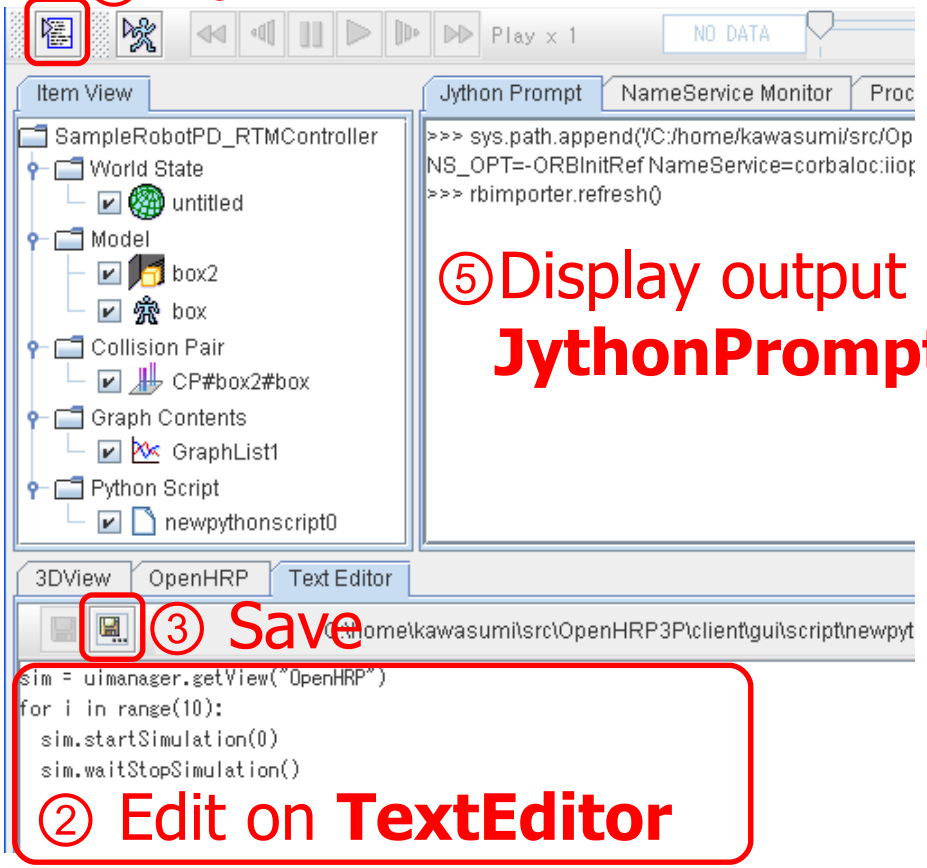
Running Script



①create script on **ItemView**



④ Run



⑤Display output on **JythonPrompt**

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