

THORMANG3

THORMANG3

Tutorial

Demo



Head Control Module – Lidar Scan –



Demo Contents



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How to Run the Demo Program



1. Running Programs in the PPC (Perception PC)

1. roscore

roscore is a collection of nodes and programs that are pre-requisites of a ROS-based system. You **must** have roscore running in order for ROS nodes to communicate. It is launched using the `roscore` command.

NOTE: If you use roslaunch, it will automatically start roscore if it detects that it is not already running.

- Connect to the PPC (Perception PC) with SSH client program.
 - **IP Address:** 10.17.3.35
 - **User Name :** robotis
 - **Password :** 111111
- roscore can be launched using the roscore executable:
`$ roscore`

2. THORMANG Sensors (Web Camera (HD Camera), Depth Camera (RealSense))

- Type the following command :
`$ roslaunch thormang3_sensors thormang3_sensors.launch`



How to Run the Demo Program



2. Running Programs in the MPC (Motion PC)

- Connect to the MPC via SSH client program.
 - **IP Address :** 10.17.3.30
 - **User Name :** robotis
 - **Password :** 111111

1. Timesync the MPC to the PPC

Synchronizing the MPC to the PPC is important so you can synchronize the data values of the connected devices

- Type and run the following shell script :

```
#!/bin/sh
sudo date --set='`date -d "2 secs ago" +%s` secs'
sudo ntpdate 10.17.3.35
sudo hwclock -w
```

- Or type the following :

```
$ ./timesync_ppc
```



How to Run the Demo Program



2. Running Programs in the MPC

3. THORMANG3 Manager with TF, Lidar

`thormang3_manager` is a base node using ROBOTIS' framework. `thormang3_manager` must be running before you can run the Simple Demo nodes and before you can check the sensors as they are using `thormang3_manager`.

- To run `thormang3_manager`, simply type the following command:

```
$ sudo bash
```

```
# roslaunch thormang3_manager thormang3_manager.launch
```



How to Run the Demo Program



3. Running Programs in the OPC (Operation PC)

1. Timesync the OPC to the PPC

In the ROS system, the time synchronization between the PC is important.

- Make the shell script as follows :

```
#!/bin/sh
sudo date --set='-2 secs'
sudo ntpdate 10.17.3.35
sudo hwclock -w
```

- Run the shell script

2. Visualization

- To launch the GUI, type the following command:

```
$ roslaunch thormang3_description thormang3_opc.launch
```

3. Demo

- To launch the demo, type the following command:

```
$ roslaunch thormang3_demo thormang3_demo.launch
```

4. Note

- Refer to User's Guide to set ROS Environment.



Visualization



1. GUI (OPC)

Thormang3 Demo GUI

Ros Communications

Logging

Basic Control

Robot Init Pose Make PointCloud

FT Air FT Ground Apply Init FT Save FT calibration

Interactive Marker

x	y	z	r	p	y
0.000 m	0.000 m	0.000 m	0.0 °	0.0 °	0.0 °

Set Clear

Mode

Walking Manipulation Head Control Motion Demo

none manipulation_module walking_module head_control_module action_module gripper_module

[01] r_arm_sh_p1	none	[02] l_arm_sh_p1	none
[03] r_arm_sh_r	none	[04] l_arm_sh_r	none
[05] r_arm_sh_p2	none	[06] l_arm_sh_p2	none
[07] r_arm_el_y	none	[08] l_arm_el_y	none
[09] r_arm_wr_r	none	[10] l_arm_wr_r	none
[11] r_arm_wr_y	none	[12] l_arm_wr_y	none
[13] r_arm_wr_p	none	[14] l_arm_wr_p	none
[15] r_leg_hip_y	none	[16] l_leg_hip_y	none
[17] r_leg_hip_r	none	[18] l_leg_hip_r	none
[19] r_leg_hip_p	none	[20] l_leg_hip_p	none
[21] r_leg_kn_p	none	[22] l_leg_kn_p	none
[23] r_leg_an_p	none	[24] l_leg_an_p	none
[25] r_leg_an_r	none	[26] l_leg_an_r	none
[27] torso_y	none	[28] head_y	none
[29] head_p	none	[30] l_arm_grip	none
[31] r_arm_grip	none		

Get Mode

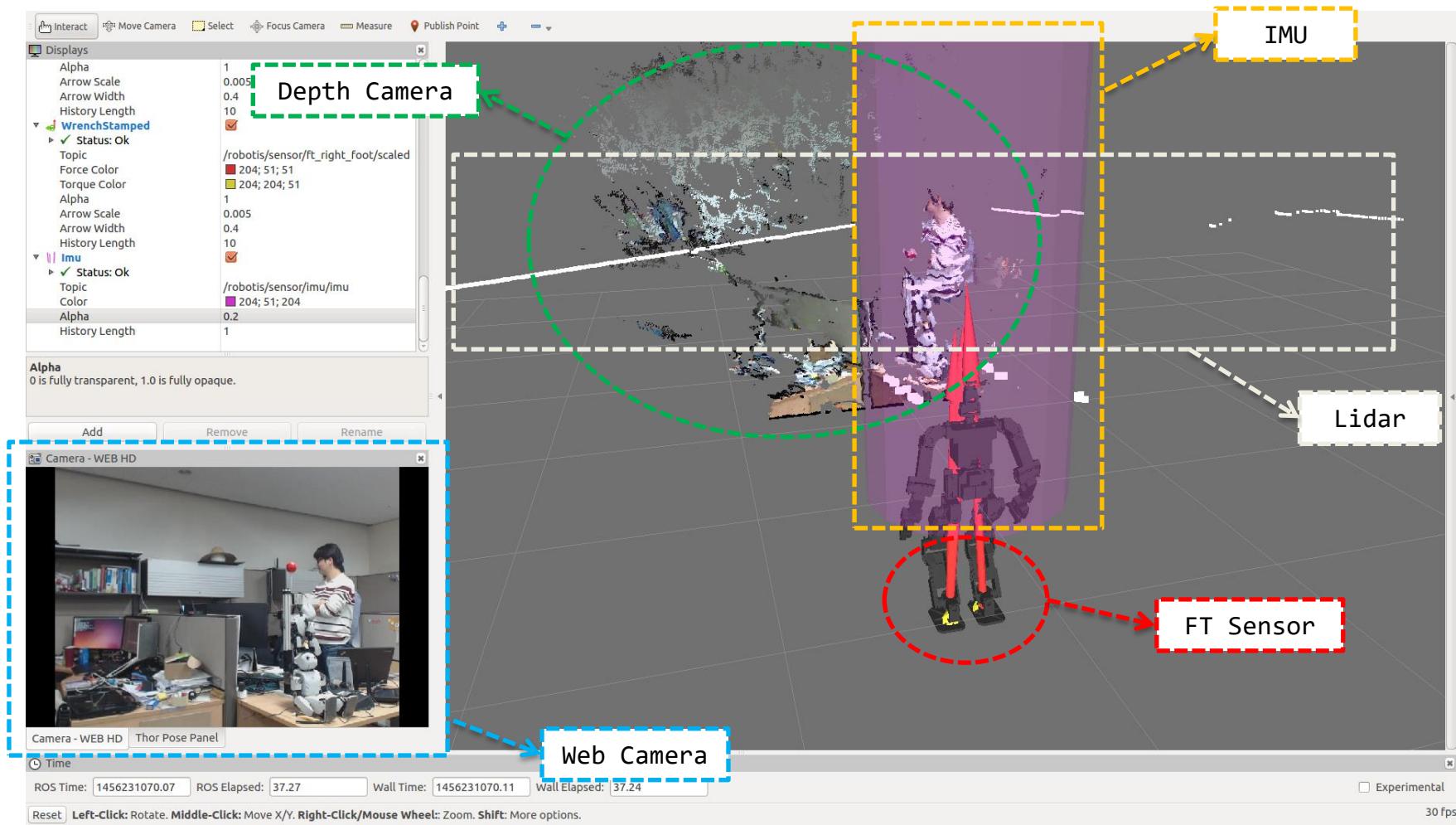
Clear



Visualization



2. Robot State and Sensors (OPC)





Demo



CONTENTS

1. Basic Demo

- Initial Pose and FT Sensor Calibration
- Setting the Robot's Control Module

2. Head Control Demo

- Assemble LaserScan
- Control Head Joints

3. Manipulation Demo

- Joint Space Control
- Task Space Control
- Gripper

4. Walking Demo

- Initial Pose
- Balance
- Online walking

Basic Demo



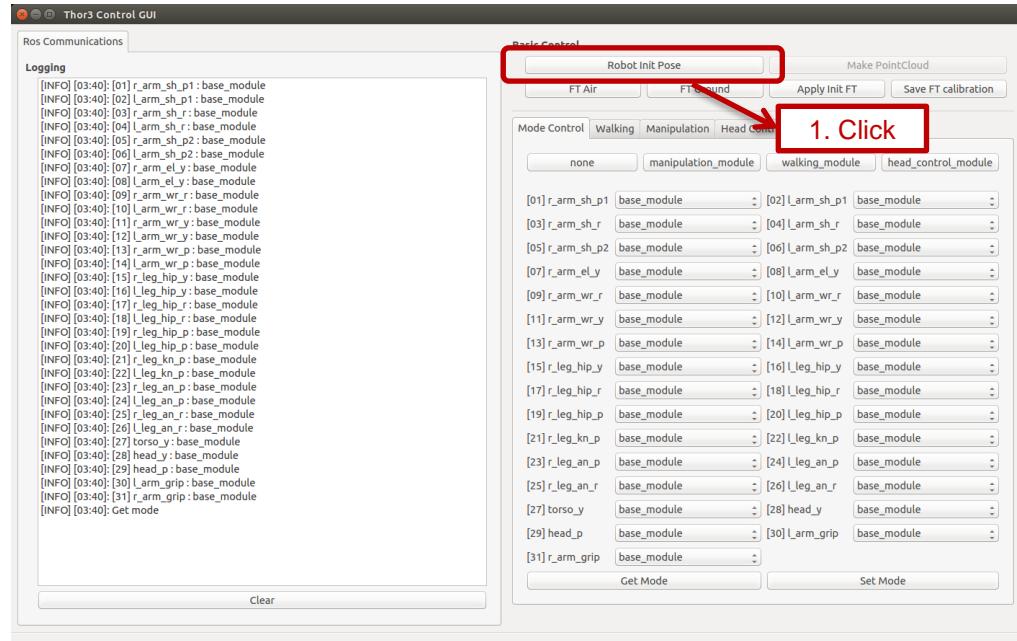
Basic Demo



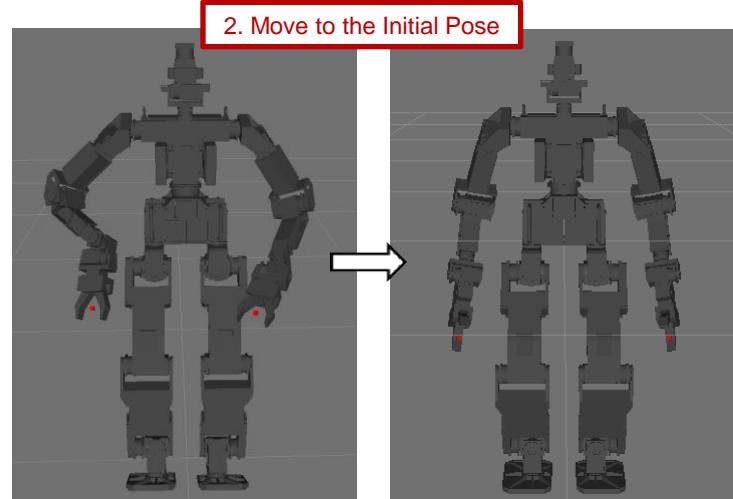
1. Basic Demo

Initial Pose

- Click 'Robot Init Pose.' The robot will move to its initial pose.



1. Click



2. Move to the Initial Pose

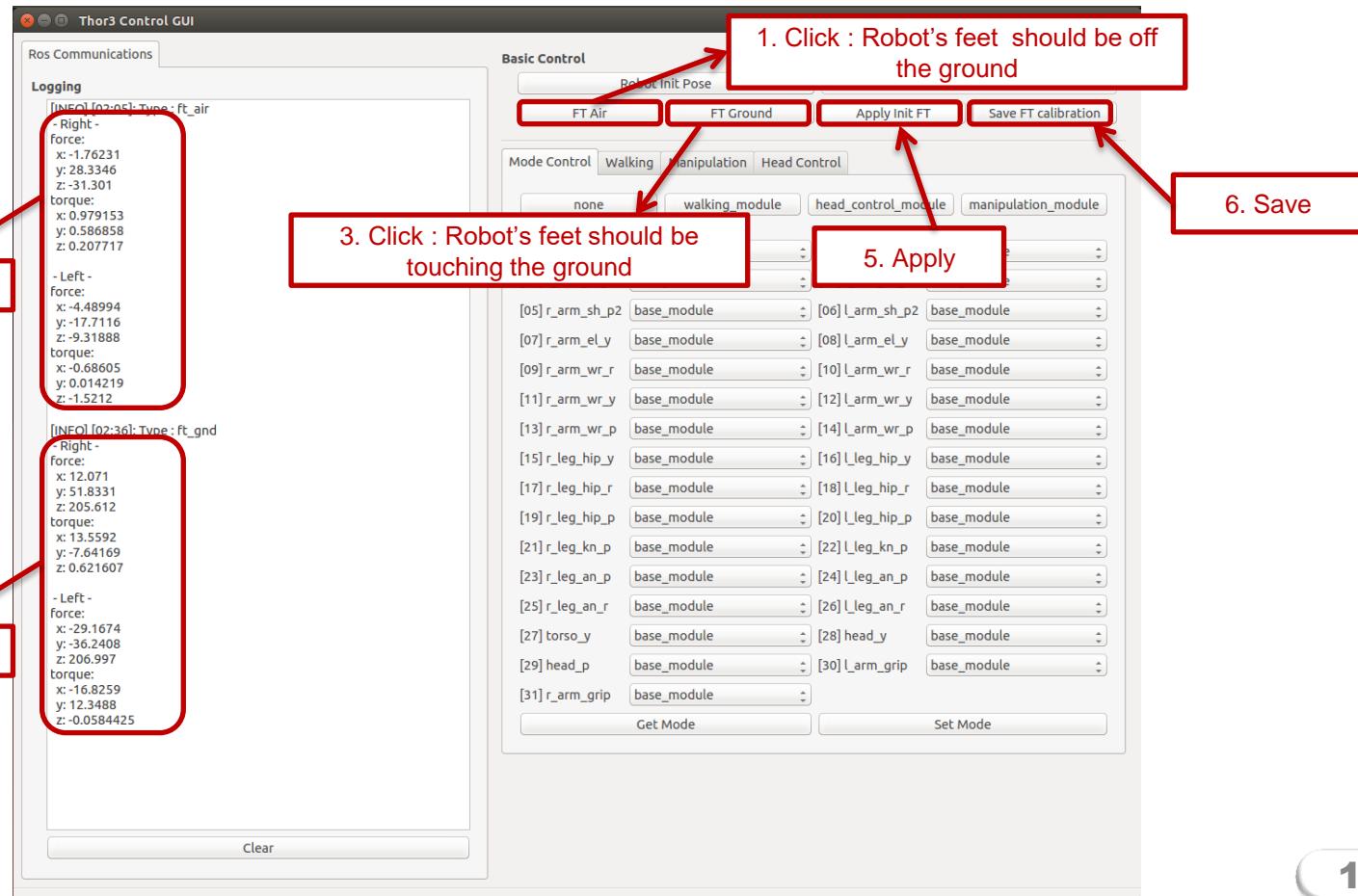


Basic Demo



1. Basic Demo

- FT Sensor Calibration
 - Calibrate the FT sensor prior to running the Walking Demo.
(It can be worked when base_module is enable.)



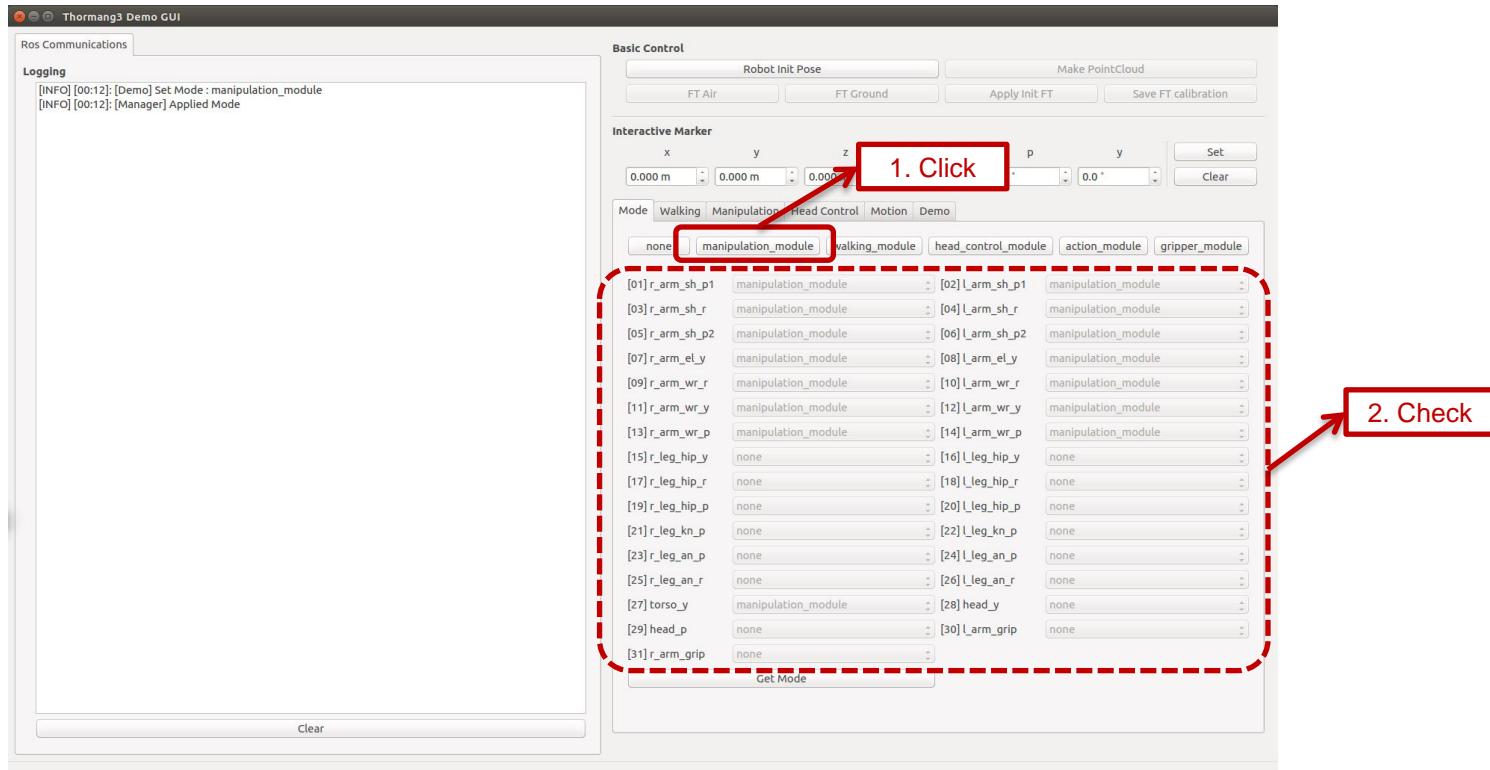


Basic Demo



1. Basic Demo

- Setting the Control Module using the preset button.
 - Click one of the preset button.



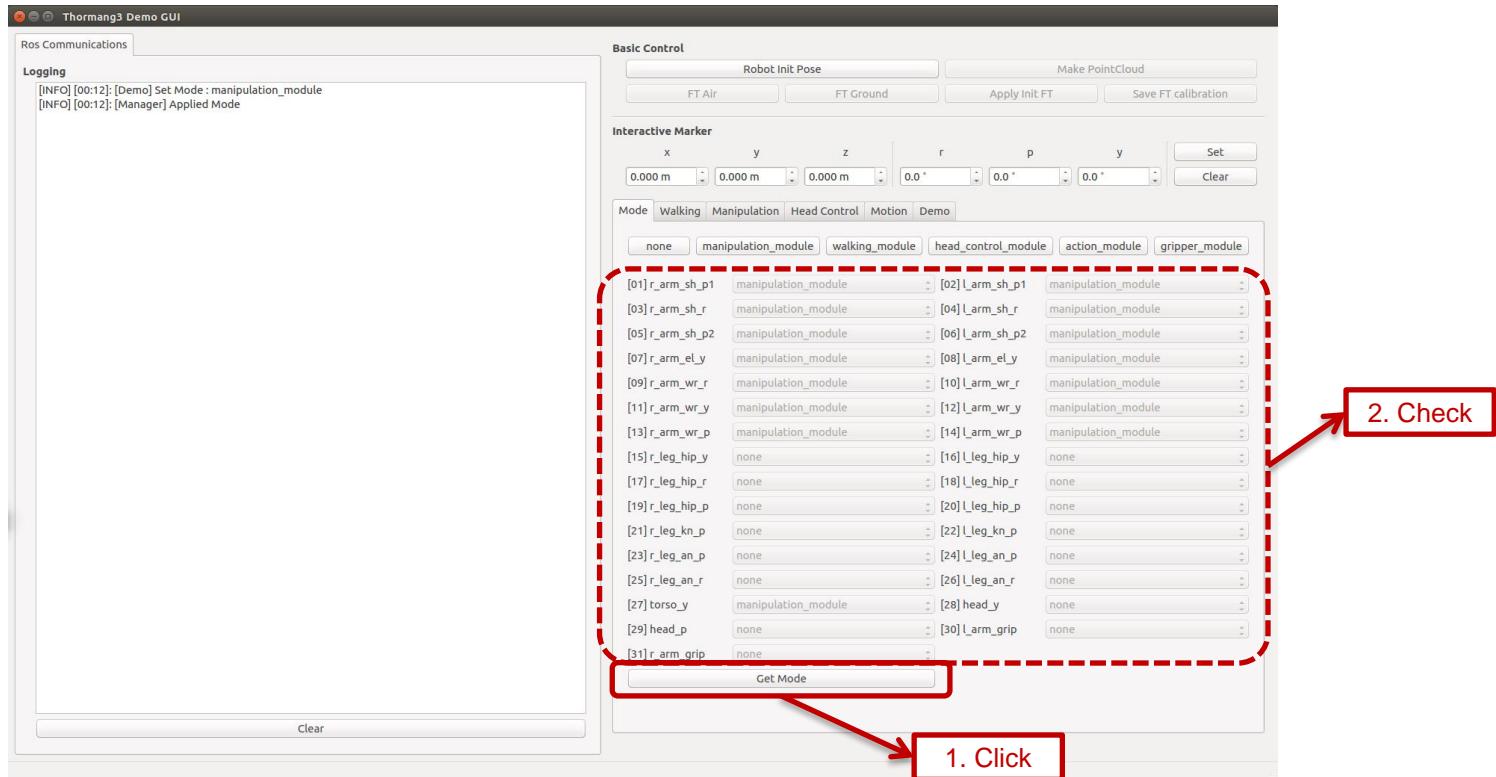


Basic Demo



1. Basic Demo

- Getting the Control Module
 - Click 'Get Mode' button.





Configuration for setting module



- Open configuration file for setting module
 - File path : /ROBOTIS-THORMANG-OPC/thormang3_demo/config/demo_config.yaml

```
id_joint:  
  1 : r_arm_sh_p1  
  2 : l_arm_sh_p1  
  3 : r_arm_sh_r  
  4 : l_arm_sh_r  
  5 : r_arm_sh_p2  
  6 : l_arm_sh_p2  
  7 : r_arm_el_y  
  8 : l_arm_el_y  
  9 : r_arm_wr_r  
 10 : l_arm_wr_r  
 11 : r_arm_wr_y  
 12 : l_arm_wr_y  
 13 : r_arm_wr_p  
 14 : l_arm_wr_p  
 15 : r_leg_hip_y  
 16 : l_leg_hip_y  
 17 : r_leg_hip_r  
 18 : l_leg_hip_r  
 19 : r_leg_hip_p  
 20 : l_leg_hip_p  
 21 : r_leg_kn_p  
 22 : l_leg_kn_p  
 23 : r_leg_an_p  
 24 : l_leg_an_p  
 25 : r_leg_an_r  
 26 : l_leg_an_r  
 27 : torso_y  
 28 : head_y  
 29 : head_p  
 30 : l_arm_grip  
 31 : r_arm_grip  
  
module_list: [none, walking_module, manipulation_module, head_control_module, base_module, action_module, gripper_module]  
module_button:  
  1 : none  
  2 : manipulation_module  
  3 : walking_module  
  4 : head_control_module  
  5 : action_module  
  6 : gripper_module
```

ID, joint table

Items for Module List

Module preset buttons



Configuration for setting module



- Applied configuration

The screenshot shows the Thor3 Control GUI interface. On the left, there is a 'Ros Communications' window displaying log messages. The main window has a 'Basic Control' tab selected. It features several buttons at the top: 'Robot Init Pose', 'FT Air', 'FT Ground', 'Mode Control' (selected), 'Walking', 'Manipulation', and 'Head Control'. Below these are four buttons: 'none', 'manipulation_module', 'walking_module', and 'head_control_module'. A red box labeled 'Module preset buttons' highlights these four buttons. A dashed red rectangle encloses the list of joints and their current module assignments. An arrow points from a red box labeled 'ID, Joint Table' to the list. Another arrow points from a red box labeled 'Items for Module List' to a dropdown menu for the joint [14] r_arm_wr_y, which is currently set to 'manipulation_module'. The list includes joints such as r_arm_sh_p1 through r_arm_grip, l_arm_sh_p1 through l_arm_grip, and various leg joints like r_leg_hip_y, r_leg_kn_p, and r_leg_an_p.

Ros Communications

Logging

```
[INFO] [09:57]: [28] head_y : none  
[INFO] [09:57]: [29] head_p : none  
[INFO] [09:57]: [30] l_arm_grip : manipulation_module  
[INFO] [09:57]: [31] r_arm_grip : manipulation_module  
[INFO] [09:57]: set mode  
[INFO] [09:58]: [01] r_arm_sh_p1 : manipulation_module  
[INFO] [09:58]: [02] l_arm_sh_p1 : manipulation_module  
[INFO] [09:58]: [03] r_arm_sh_r : manipulation_module  
[INFO] [09:58]: [04] l_arm_sh_r : manipulation_module  
[INFO] [09:58]: [05] r_arm_sh_p2 : manipulation_module  
[INFO] [09:58]: [06] l_arm_sh_p2 : manipulation_module  
[INFO] [09:58]: [07] r_arm_el_y : manipulation_module  
[INFO] [09:58]: [08] l_arm_el_y : manipulation_module  
[INFO] [09:58]: [09] r_arm_wr_r : manipulation_module  
[INFO] [09:58]: [10] l_arm_wr_r : manipulation_module  
[INFO] [09:58]: [11] r_arm_wr_y : manipulation_module  
[INFO] [09:58]: [12] l_arm_wr_y : manipulation_module  
[INFO] [09:58]: [13] r_arm_wr_p : manipulation_module  
[INFO] [09:58]: [14] l_arm_wr_p : manipulation_module  
[INFO] [09:58]: [15] r_leg_hip_y : none  
[INFO] [09:58]: [16] l_leg_hip_y : none  
[INFO] [09:58]: [17] r_leg_hip_r : none  
[INFO] [09:58]: [18] l_leg_hip_r : none  
[INFO] [09:58]: [19] r_leg_hip_p : none  
[INFO] [09:58]: [20] l_leg_hip_p : none  
[INFO] [09:58]: [21] r_leg_kn_p : none  
[INFO] [09:58]: [22] l_leg_kn_p : none  
[INFO] [09:58]: [23] r_leg_an_p : none  
[INFO] [09:58]: [24] l_leg_an_p : none  
[INFO] [09:58]: [25] r_leg_an_r : none  
[INFO] [09:58]: [26] l_leg_an_r : none  
[INFO] [09:58]: [27] torso_y : manipulation_module  
[INFO] [09:58]: [28] head_y : none  
[INFO] [09:58]: [29] head_p : none  
[INFO] [09:58]: [30] l_arm_grip : manipulation_module  
[INFO] [09:58]: [31] r_arm_grip : manipulation_module  
[INFO] [09:58]: Get mode
```

Basic Control

Robot Init Pose FT Air FT Ground

Mode Control Walking Manipulation Head Control

Module preset buttons

ID, Joint Table

Items for Module List

Get Mode Set Mode

Head Control Demo



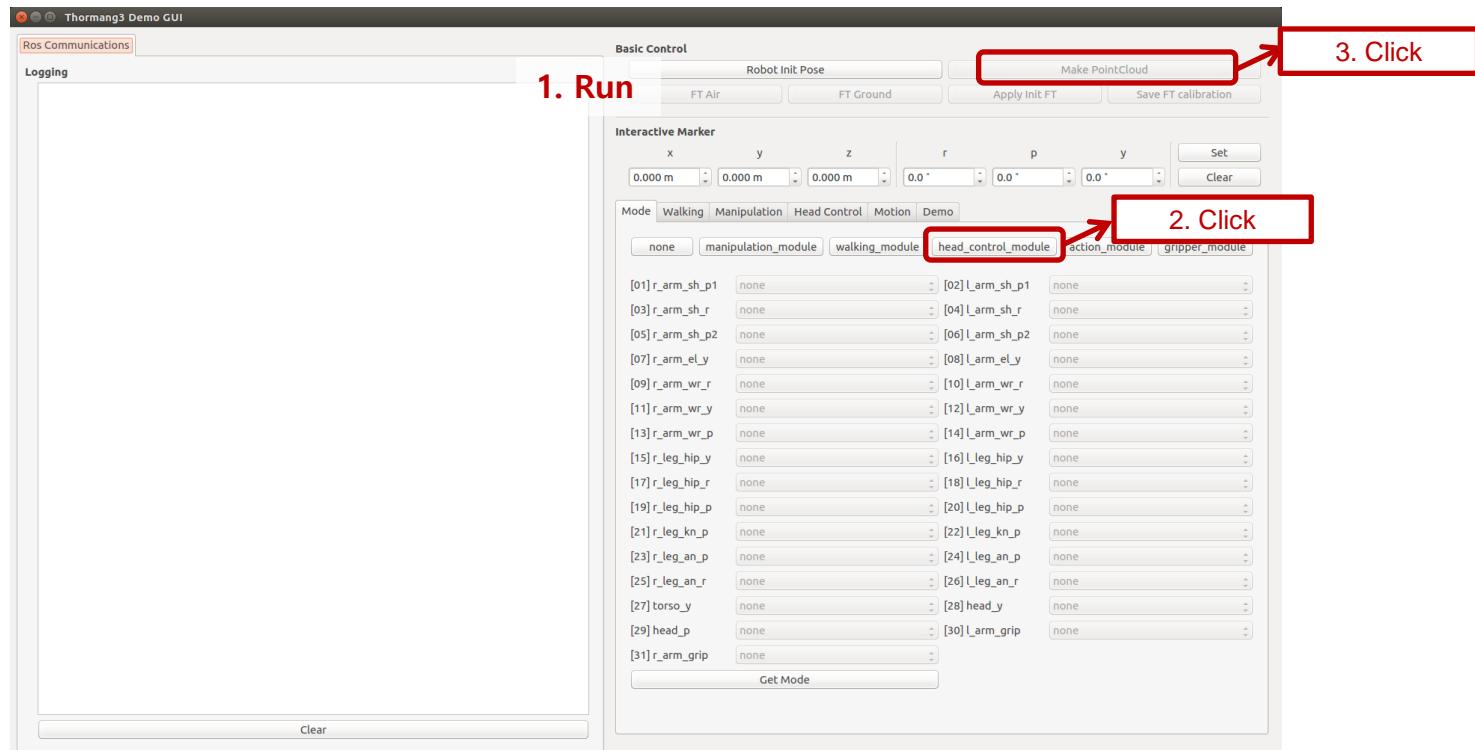
Head Control Demo



2. Head Control Demo

- Assemble LaserScan

1. Move the head pitch joint to assemble LaserScan
 - Set module : head_control_module
 - » Click '**head_control_module**'
 - Click '**Make PointCloud**' button



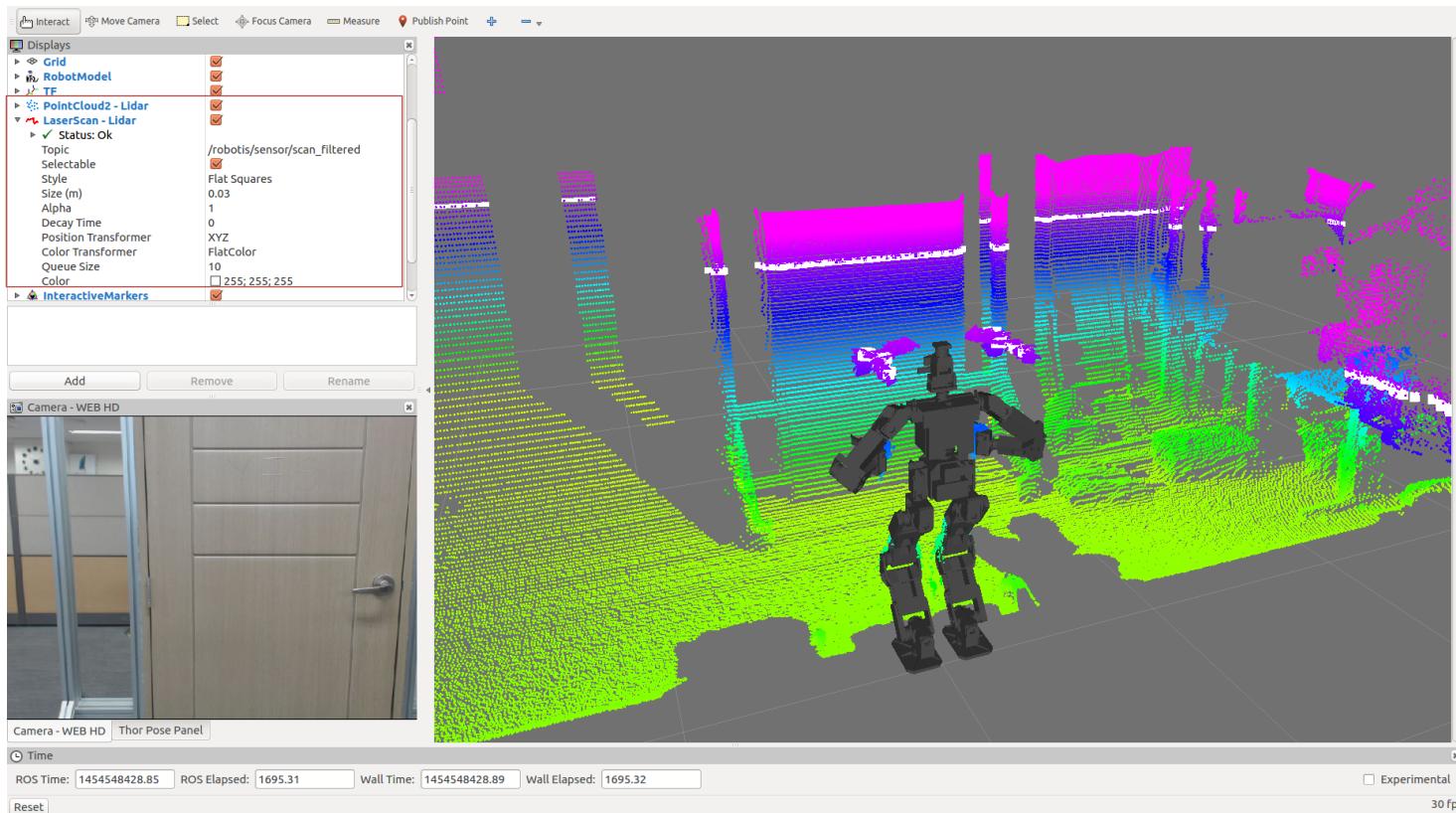


Head Control Demo



2. Head Control Demo

- Assemble LaserScan
- 2. LaserScan and TF automatically create the PointCloud
- 3. Check PointCloud and LaserScan (white line) in rviz



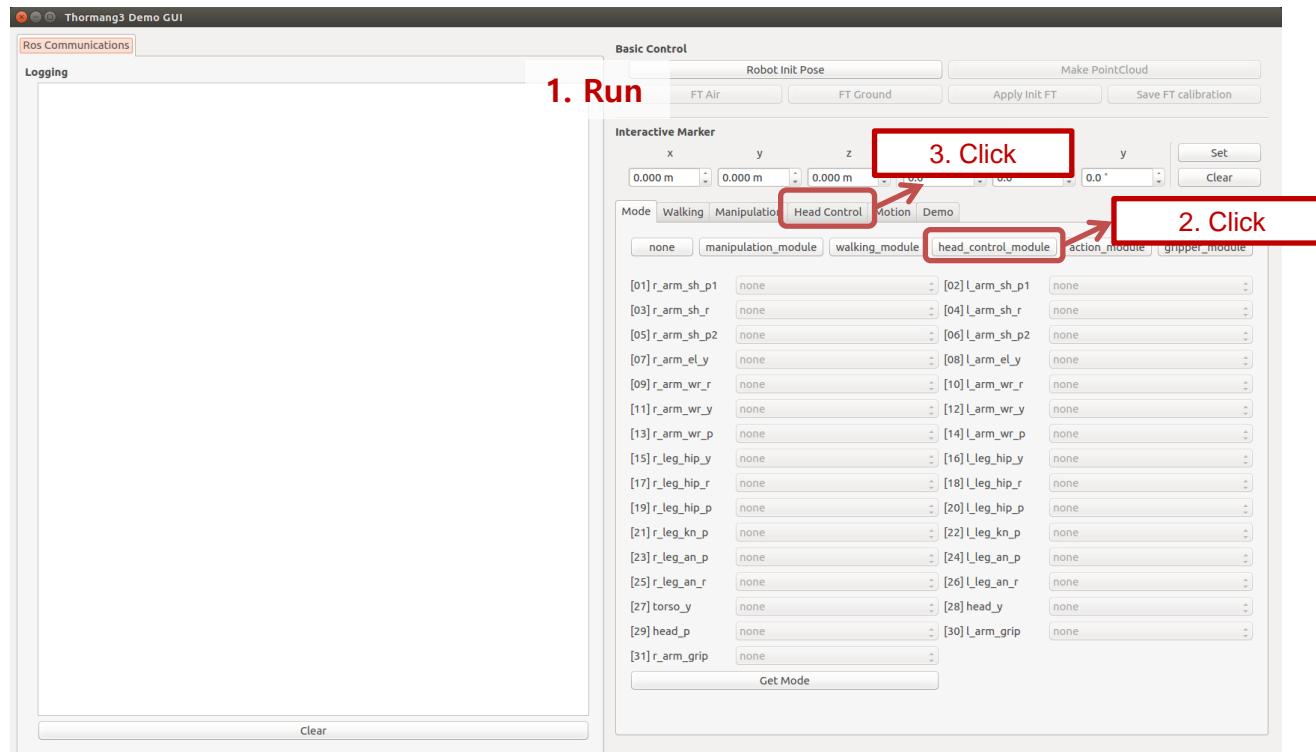


Head Control Demo



2. Head Control Demo

- Control Pan/Tilt Head Joints
1. Set module : head_control_module
 - Click '**head_control_module**'
 - Click '**Set Mode**' button
 2. Change control tab to '**Head Control**'



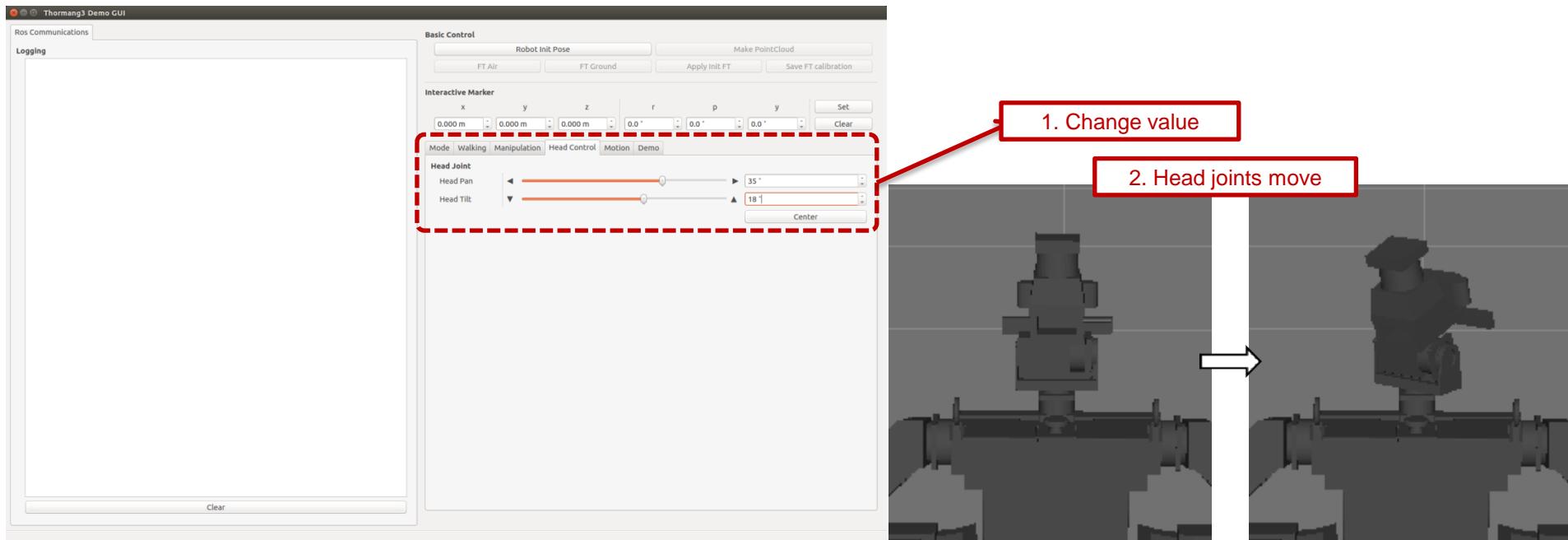


Head Control Demo



2. Head Control Demo

- Control Pan/Tilt Head Joints
- 3. Move the slide bar or input the joint angle values to move the head joint
- 4. Click 'center' button to move the head to the initial posture



Manipulation Demo

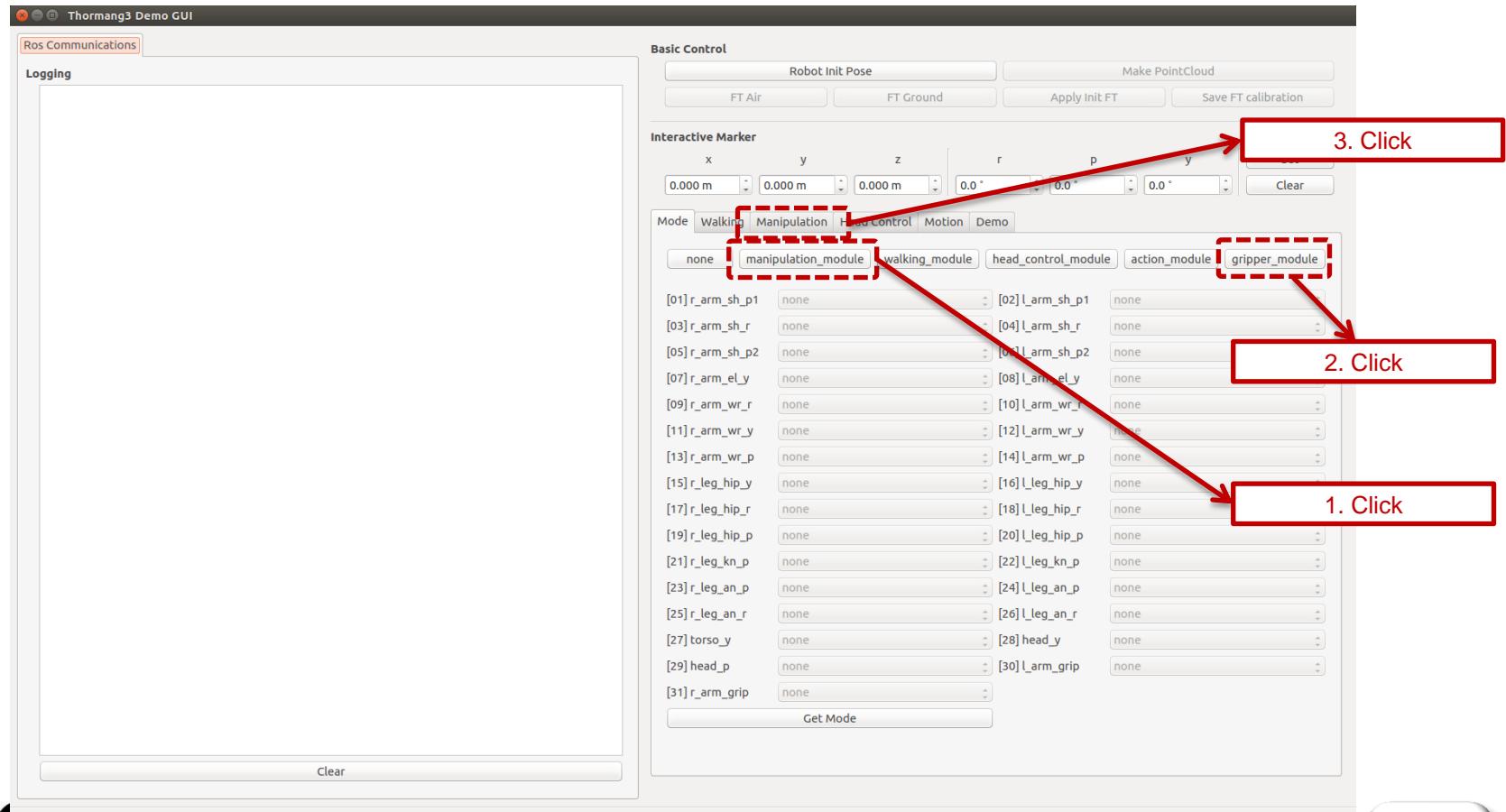


Manipulation Demo



3. Manipulation Demo

- Set Module : manipulation_module, gripper_module
- Go to the manipulation tab



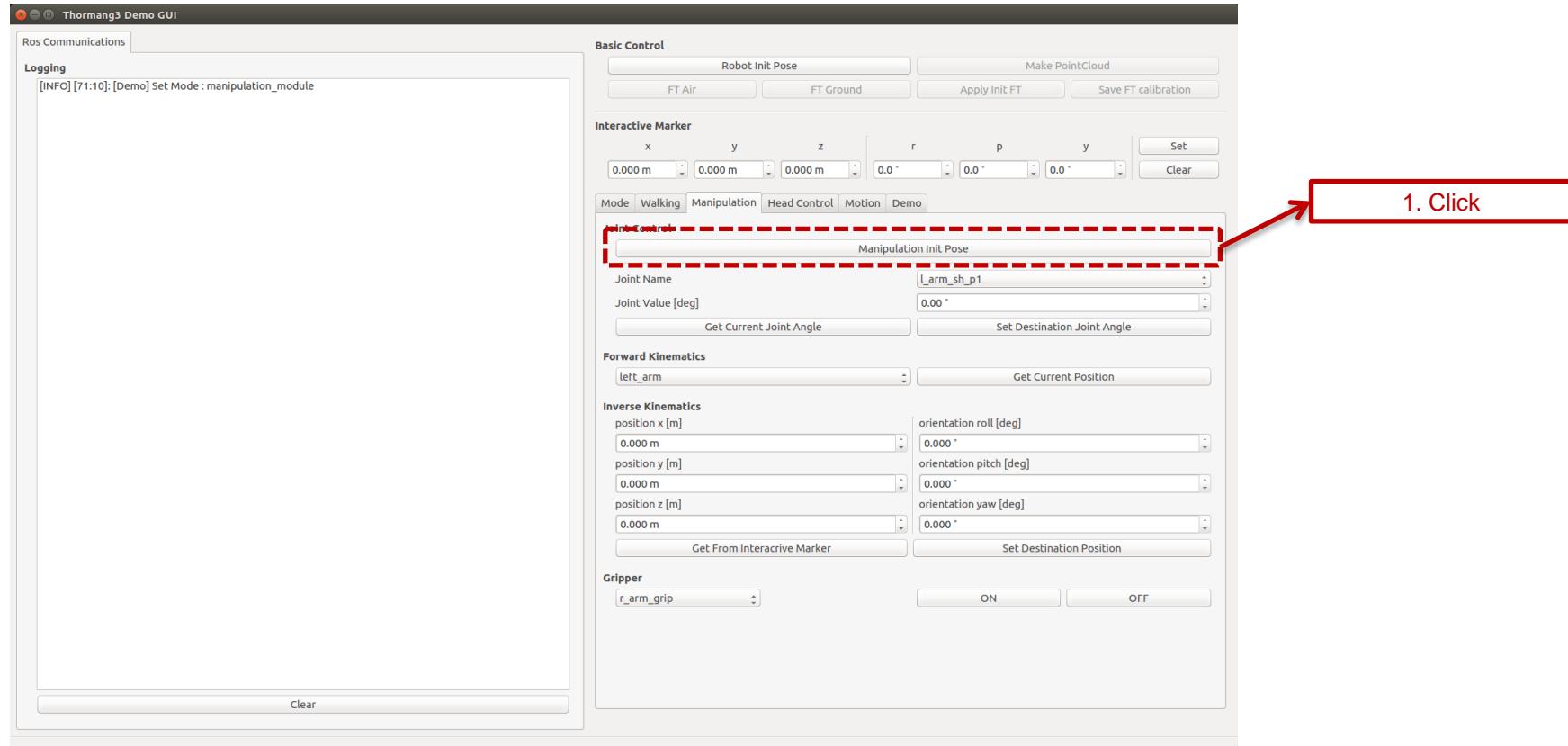


Manipulation Demo



3. Manipulation Demo

- Manipulation Initial Pose
 - Click '**Manipulation Init_Pose**'



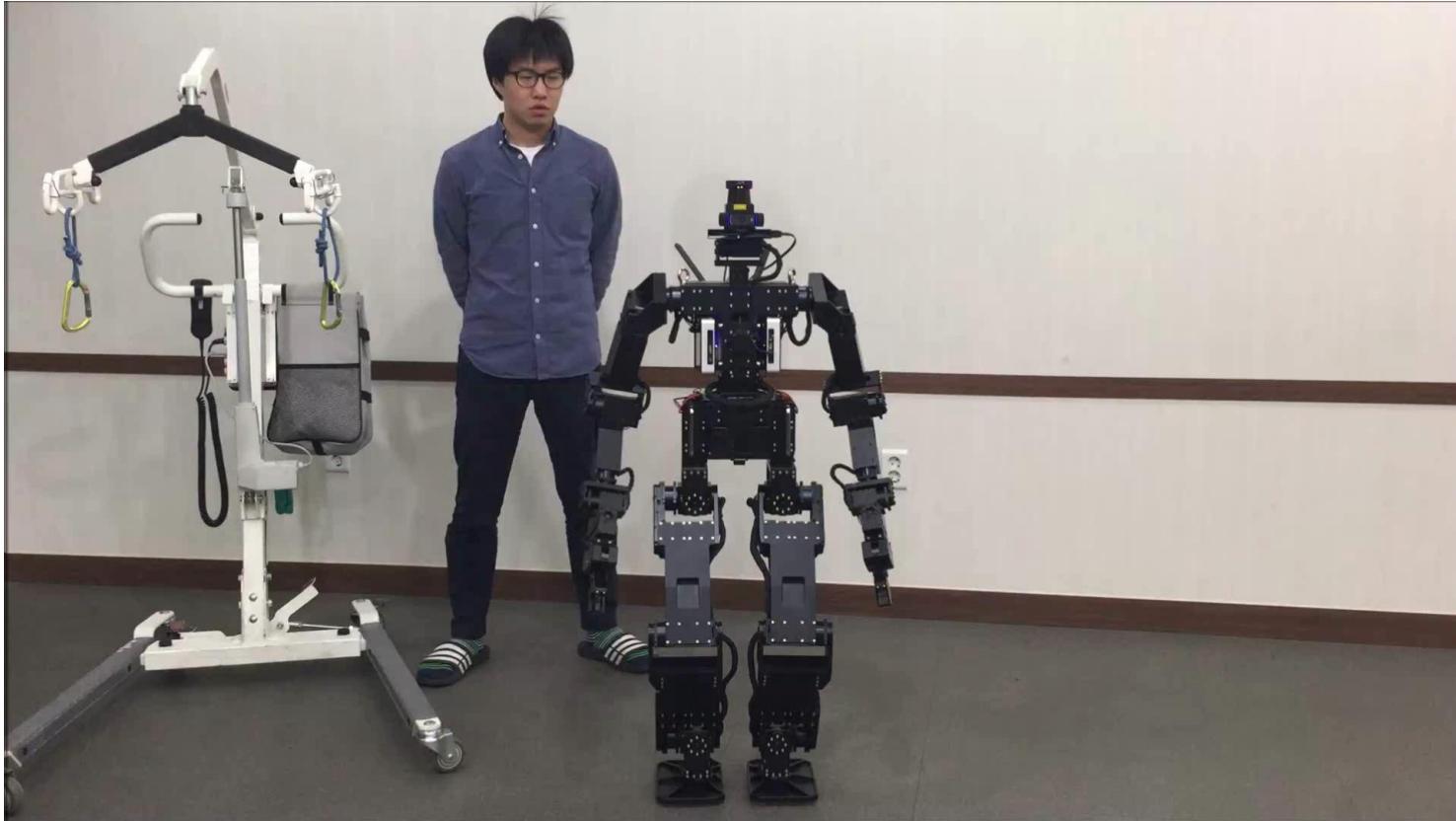


Manipulation Demo



3. Manipulation Demo

- Manipulation Initial Pose Video





Manipulation Demo



3. Manipulation Demo

- Joint Space Control
 - 1. Read present joint angle

The screenshot shows the Thormang3 Demo GUI interface. In the 'Joint Control' section, the 'Joint Name' dropdown is set to 'l_arm_sh_p1'. A red dashed box highlights this dropdown. To the right, a list of joint names is displayed in a scrollable window:

- l_arm_sh_p1
- l_arm_sh_r
- l_arm_sh_p2
- l_arm_el_y
- l_arm_wr_r
- l_arm_wr_y
- l_arm_wr_p
- l_arm_grip
- r_arm_sh_p1
- r_arm_sh_r
- r_arm_sh_p2
- r_arm_el_y
- r_arm_wr_r
- r_arm_wr_y
- r_arm_wr_p
- r_arm_grip

Three red callout boxes with arrows point to specific parts of the interface:

1. Select: Points to the list of joint names.
2. Click: Points to the 'Get Current Joint Angle' button.
3. Read Value: Points to the 'Joint Value [deg]' input field.

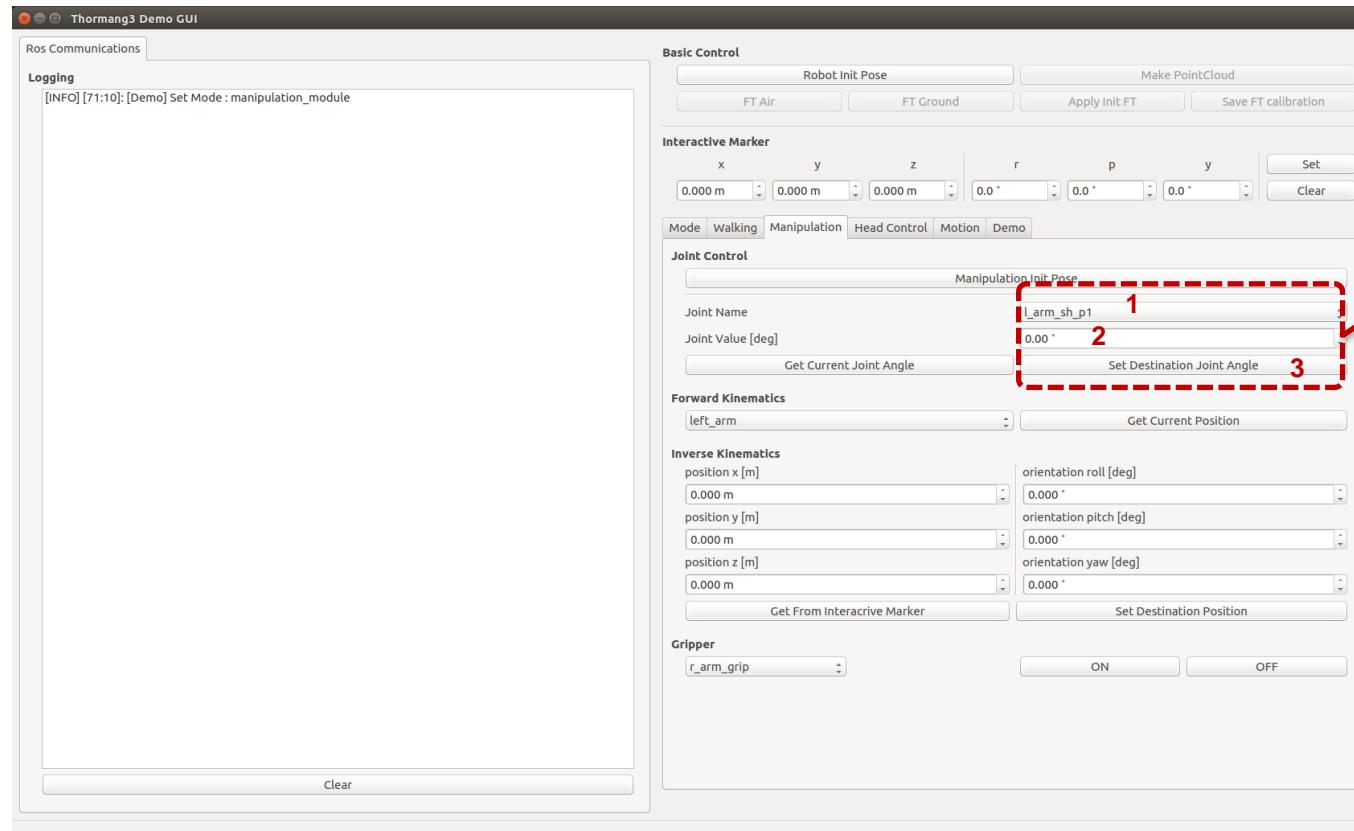


Manipulation Demo



3. Manipulation Demo

- Joint Space Control
- 2. Write desired joint angle



1. Select
`L_arm_sh_p1`
`L_arm_sh_r`
`L_arm_sh_p2`
`L_arm_el_y`
`L_arm_wr_r`
`L_arm_wr_y`
`L_arm_wr_p`
`L_arm_grip`
`r_arm_sh_p1`
`r_arm_sh_r`
`r_arm_sh_p2`
`r_arm_el_y`
`r_arm_wr_r`
`r_arm_wr_y`
`r_arm_wr_p`
`r_arm_grip`
2. Set Value
3. Click

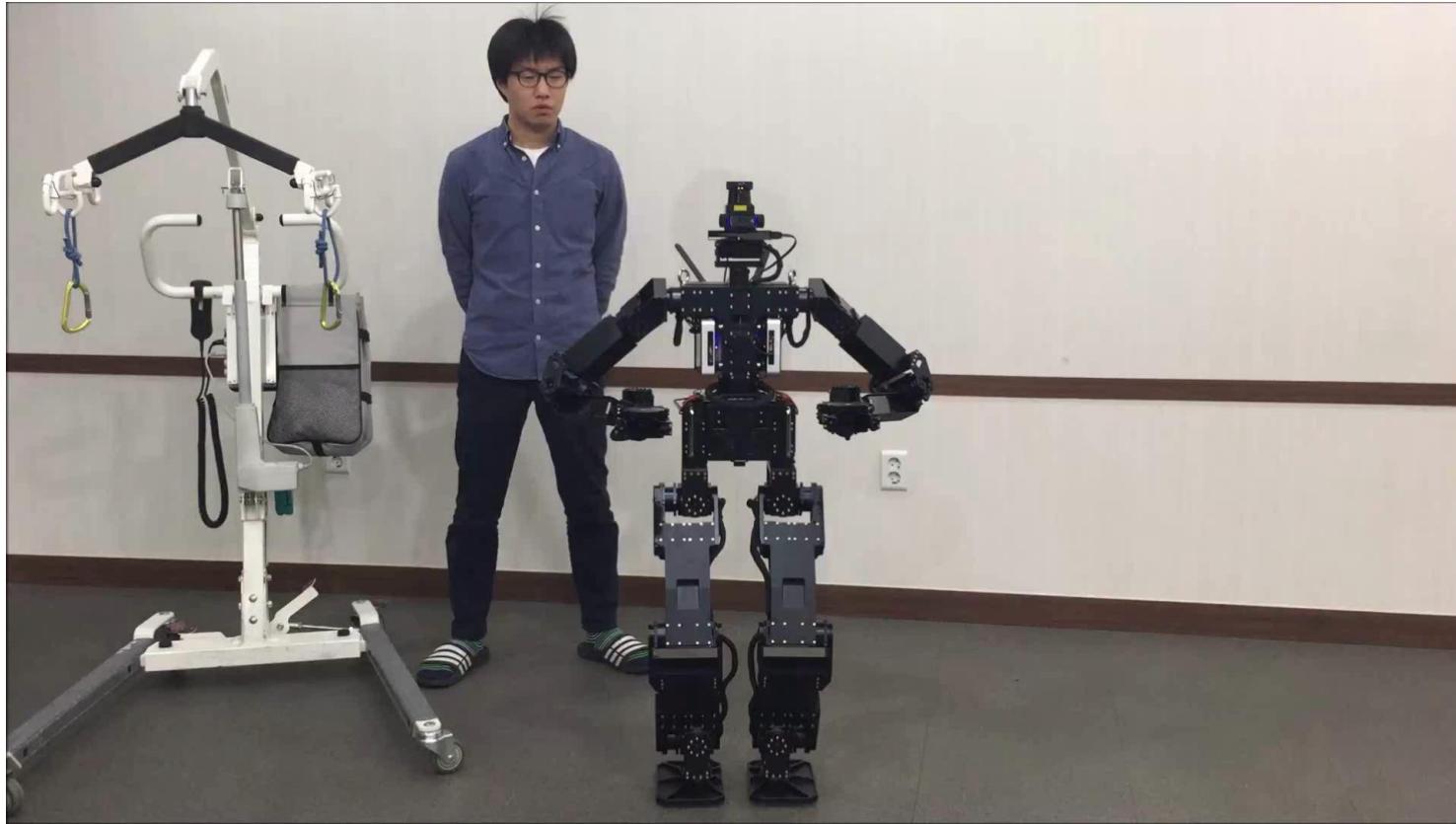


Manipulation Demo



3. Manipulation Demo

- Joint Space Control Video



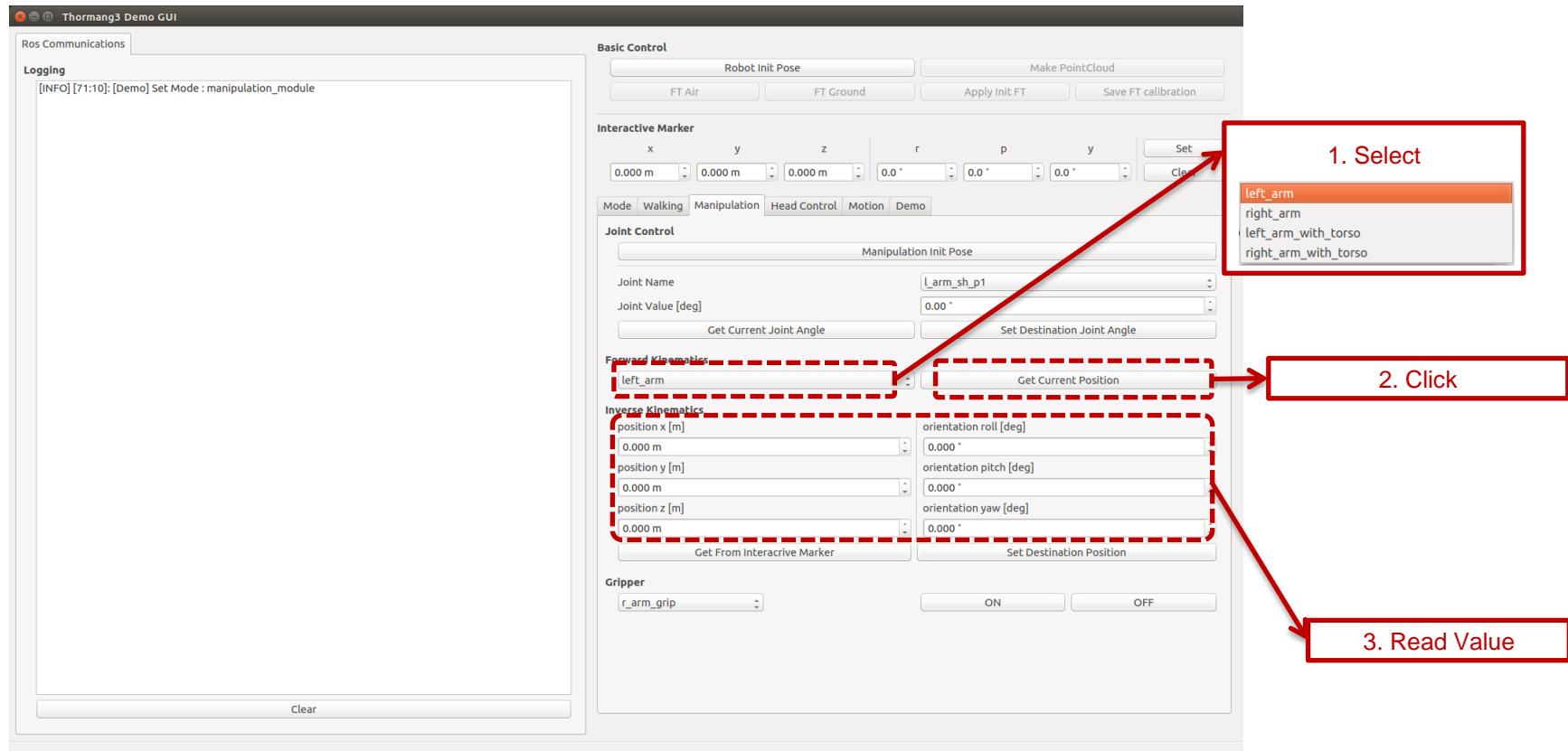


Manipulation Demo



3. Manipulation Demo

- Task Space Control
 - Read end effector's pose (FK)



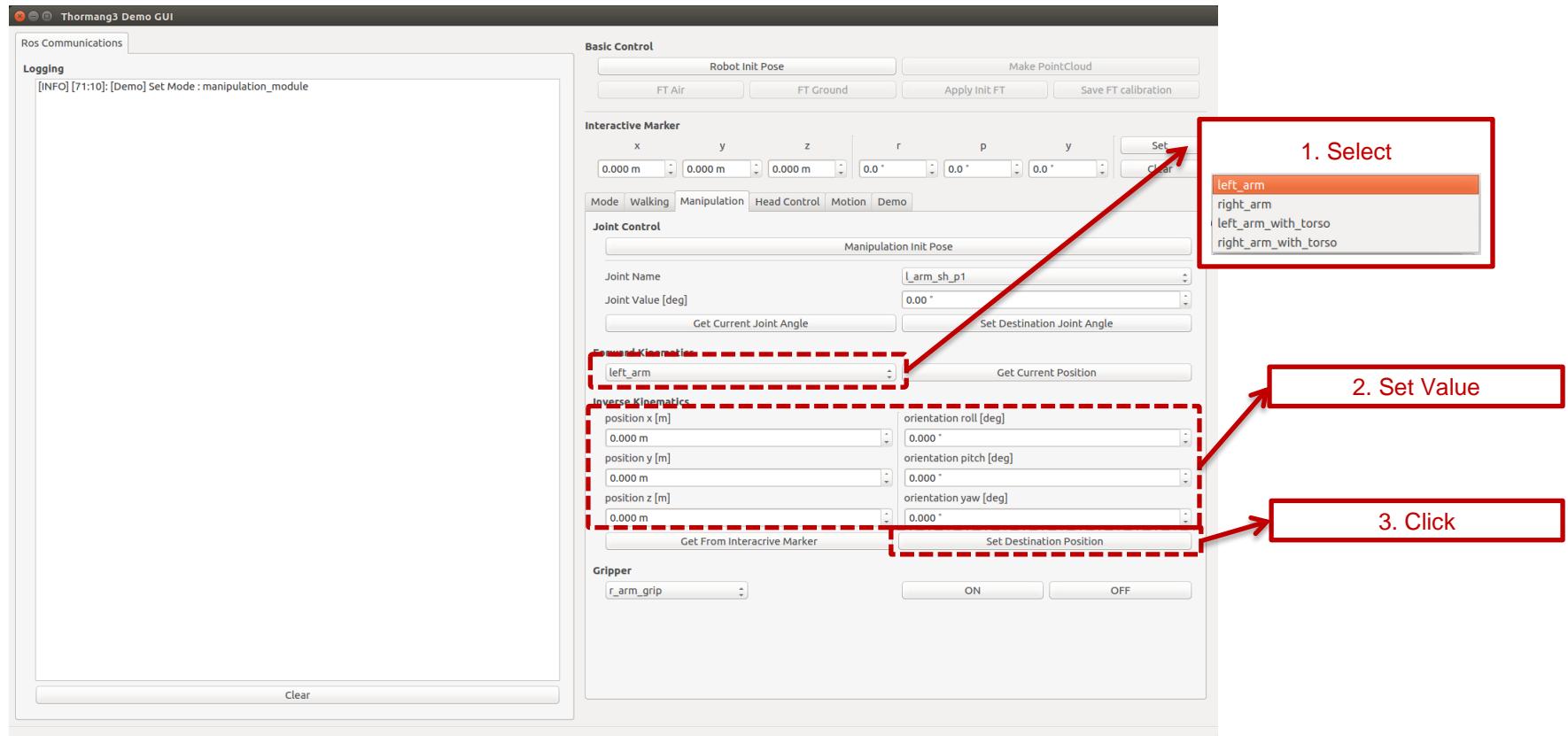


Manipulation Demo



3. Manipulation Demo

- Task Space Control
 - Write end effector's pose (IK)



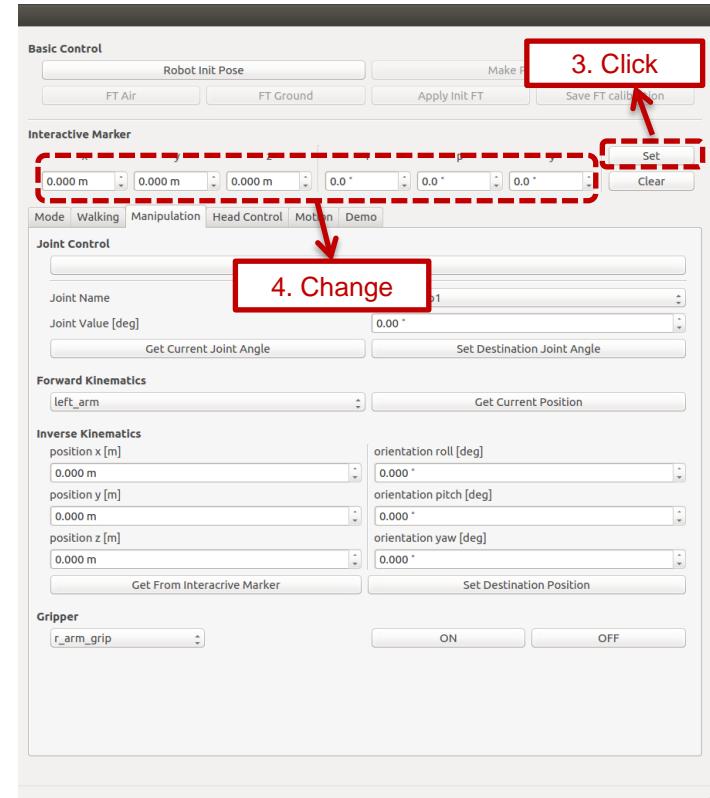
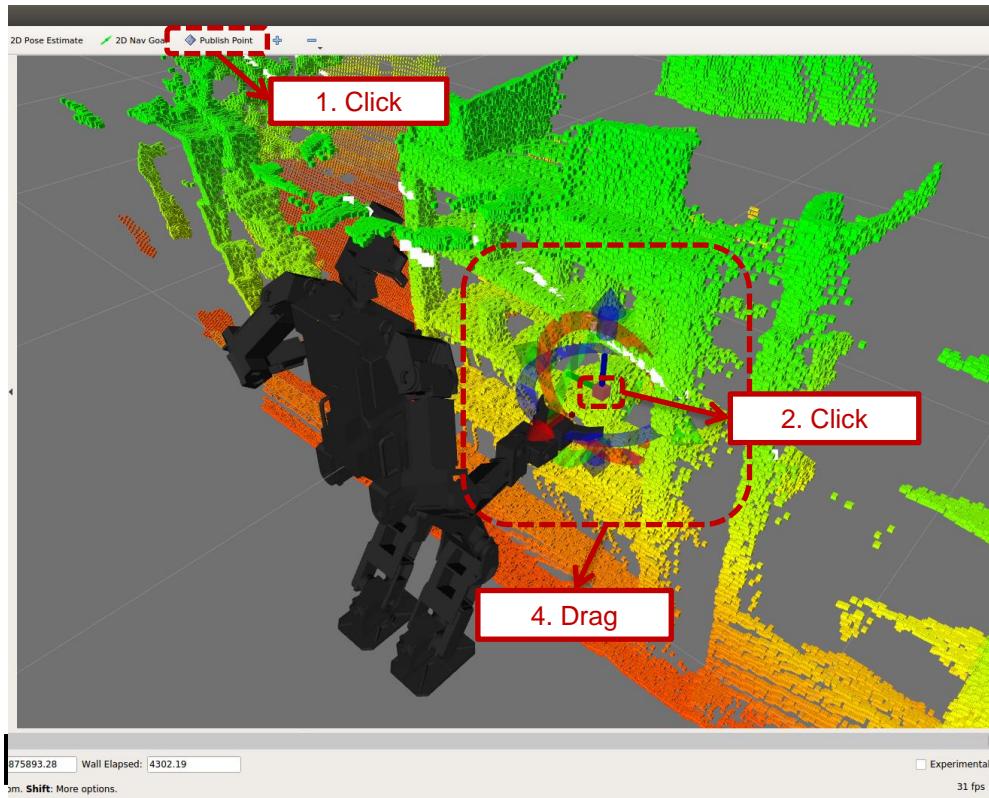


Manipulation Demo



3. Manipulation Demo

- Task Space Control
 - Get end effector's pose using rviz (IK)
 - Click 'publish point' button
 - Click the target or the base position
 - Click 'Set' button in GUI Demo
 - Drag the Interactive Marker or Change the value



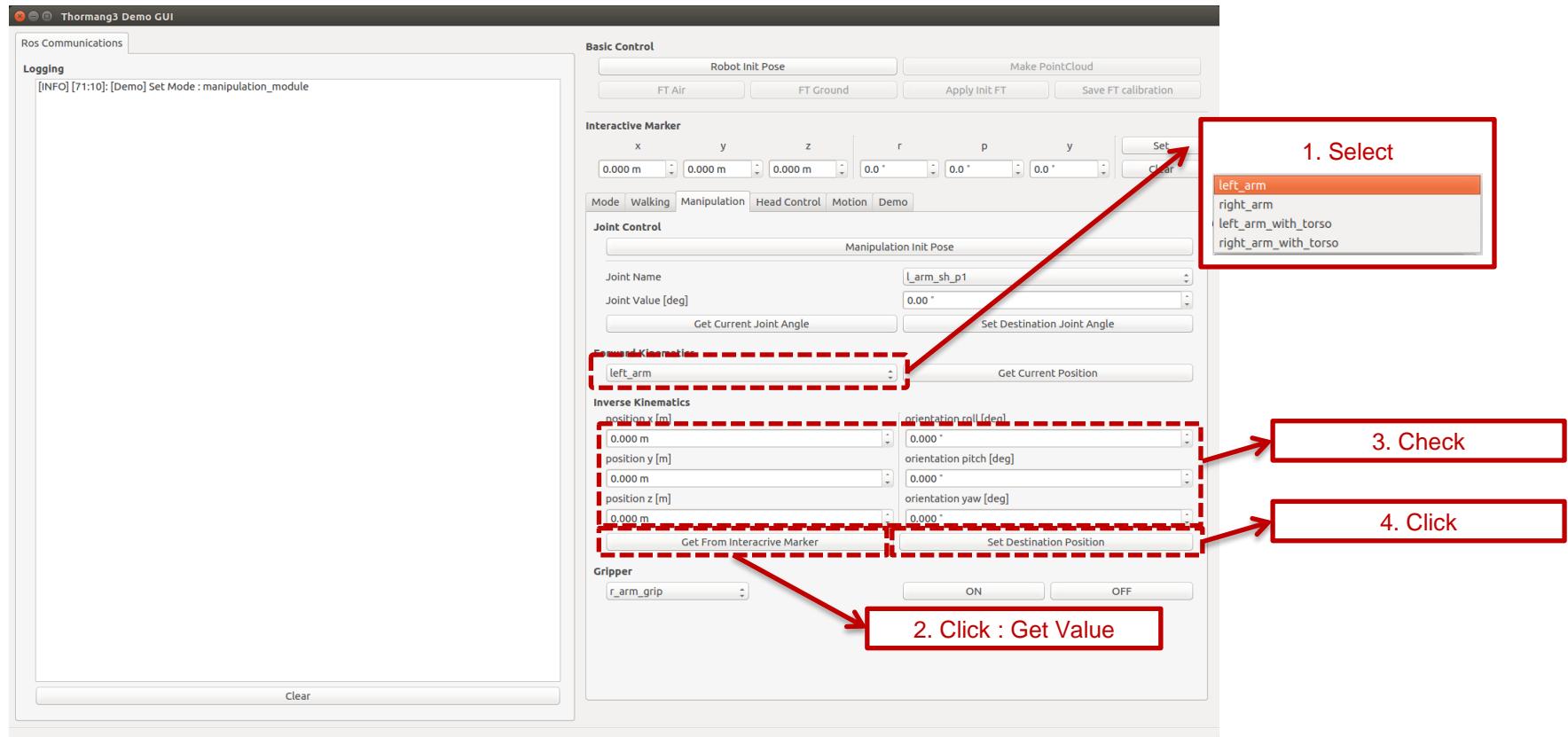


Manipulation Demo



3. Manipulation Demo

- Task Space Control
 - Write end effector's pose using rviz (IK)



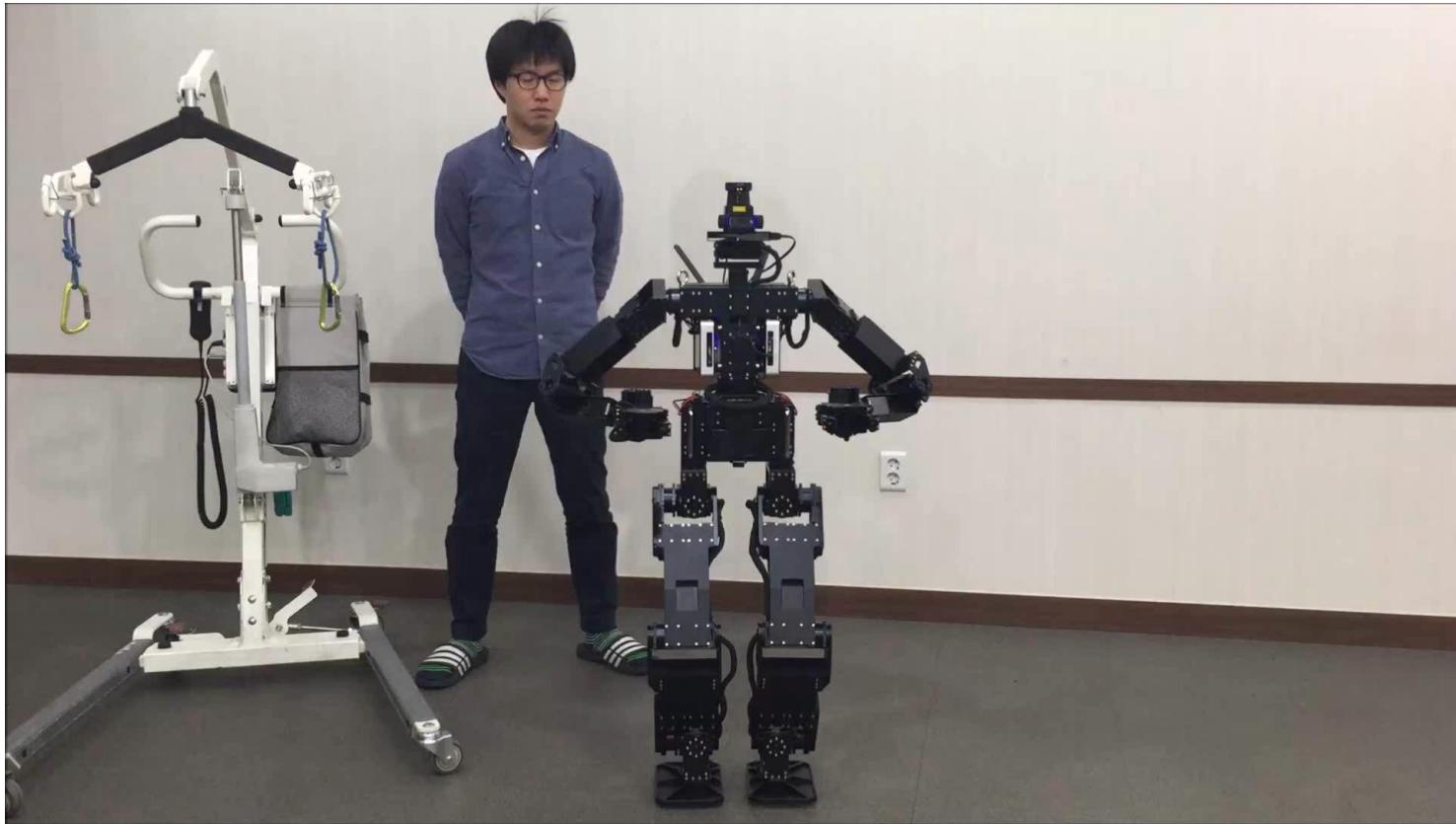


Manipulation Demo



3. Manipulation Demo

- Task Space Control Video



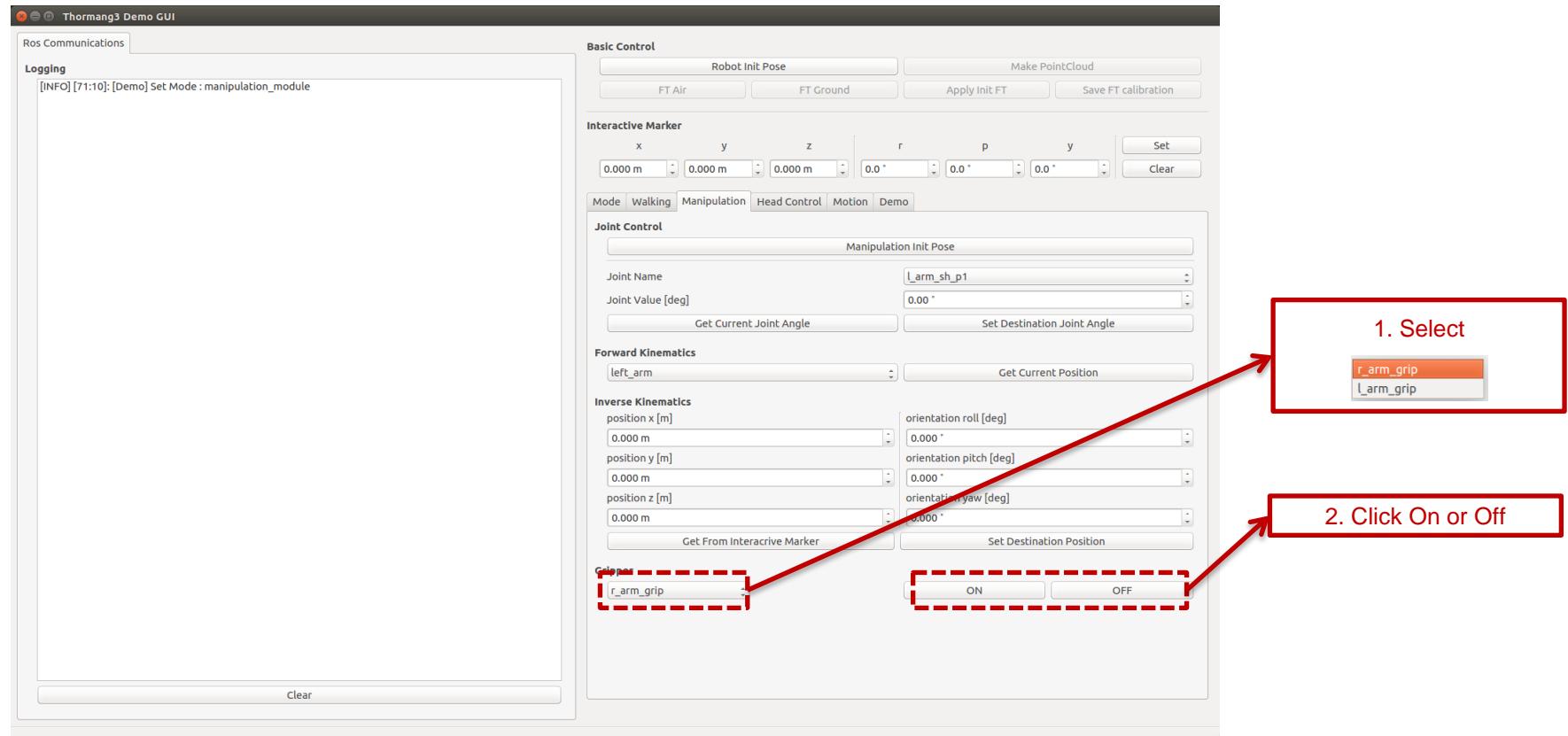


Manipulation Demo



3. Manipulation Demo

- Gripper On/Off (Closed/Open)



Walking Demo



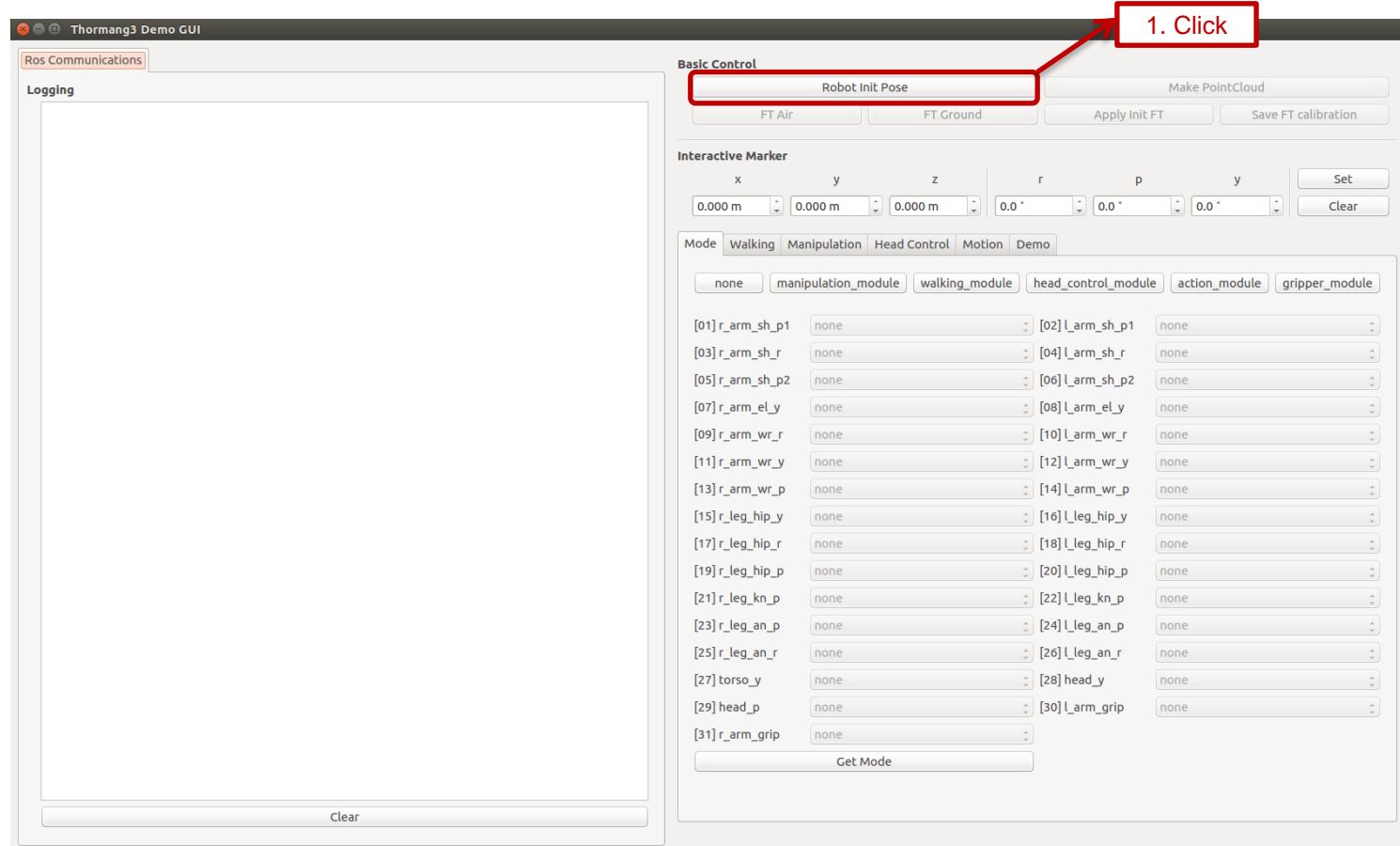
Walking Demo



4. Walking Demo

- Initial Pose

- Before running the Walking Control demo, make the robot move to initial position.





Walking Demo



4. Walking Demo



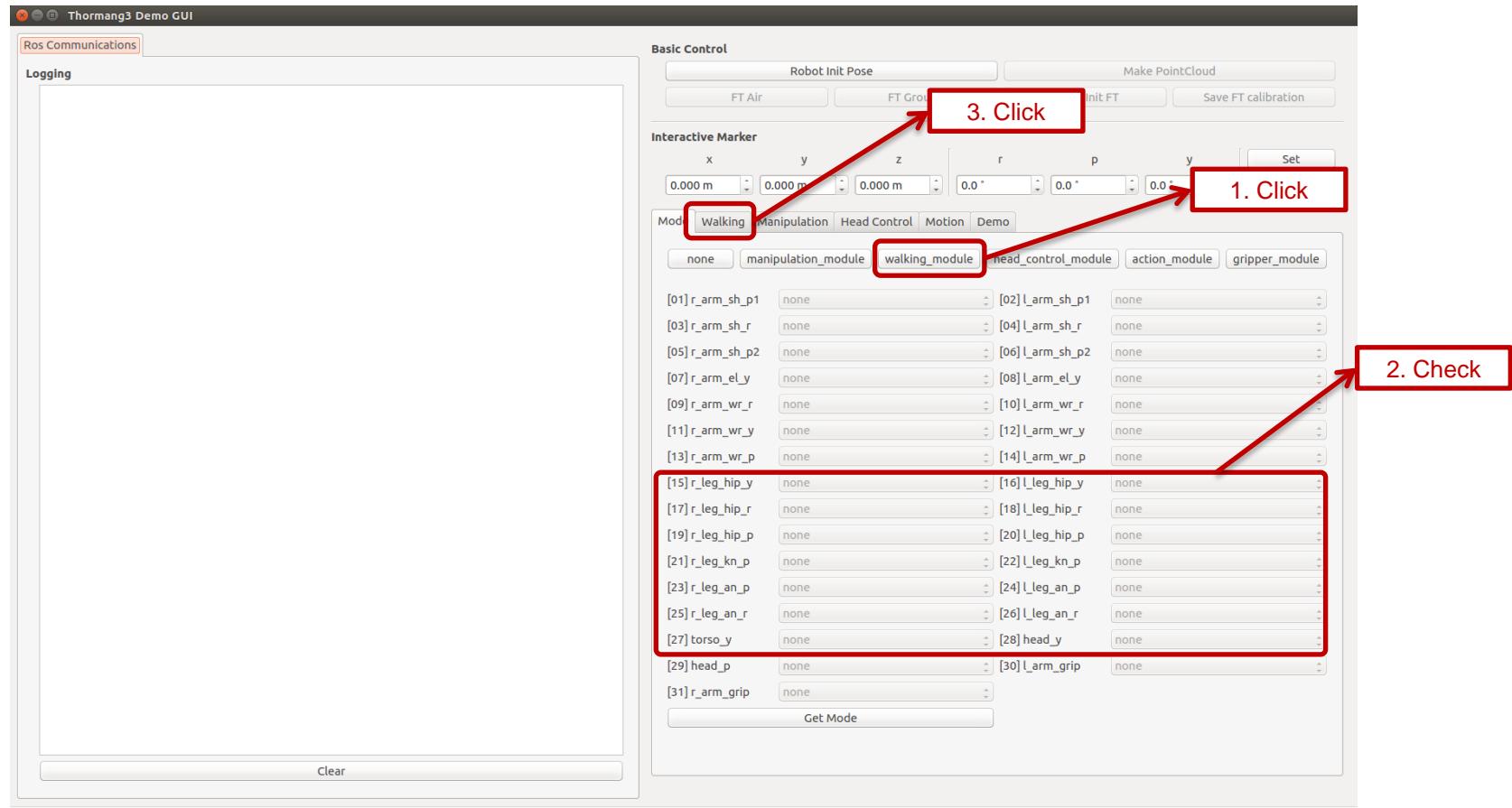


Walking Demo



4. Walking Demo

- Set Module : click 'walking_module' button
- Go to the Walking tab



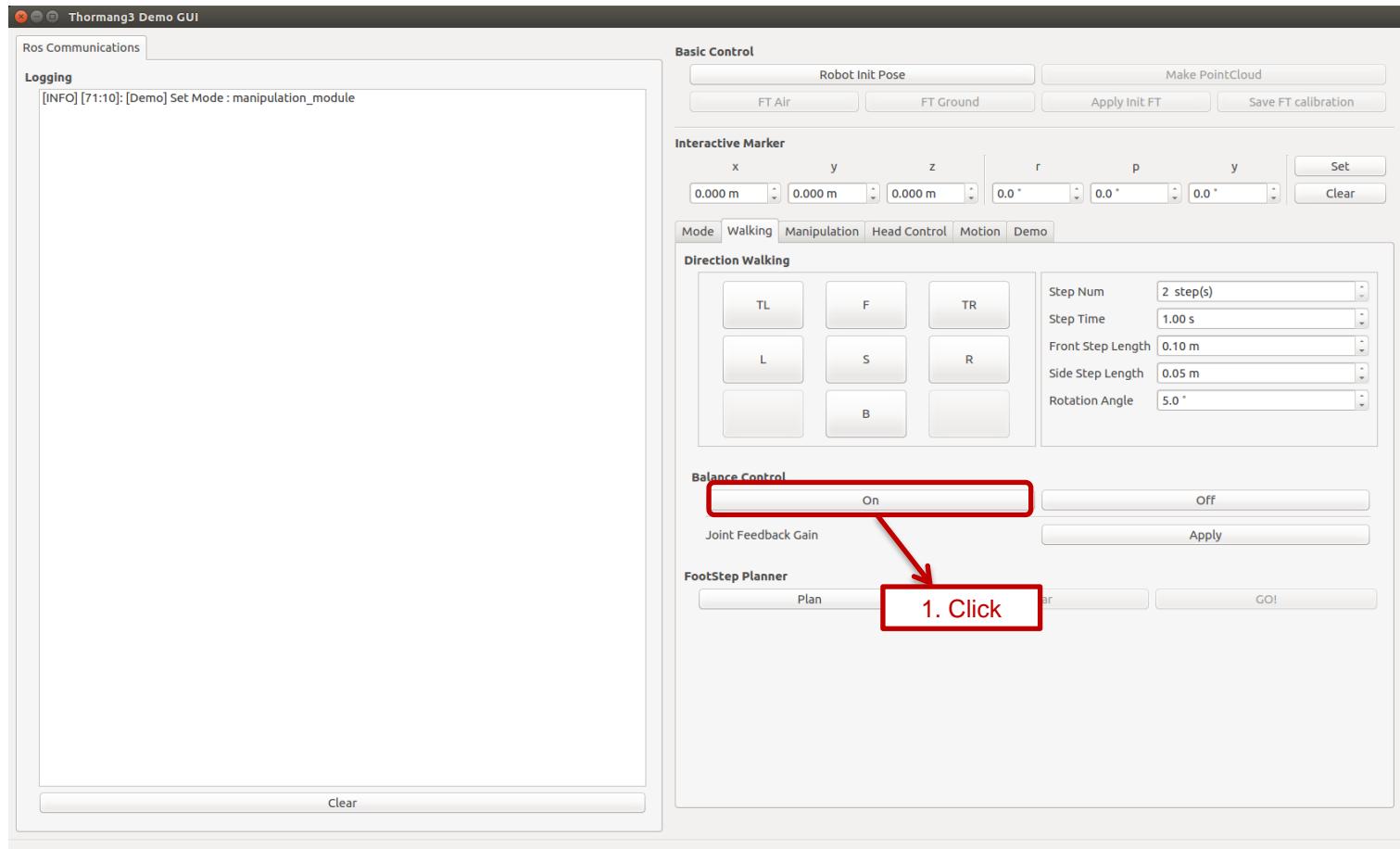


Walking Demo



4. Walking Demo

- Balance THORMANG



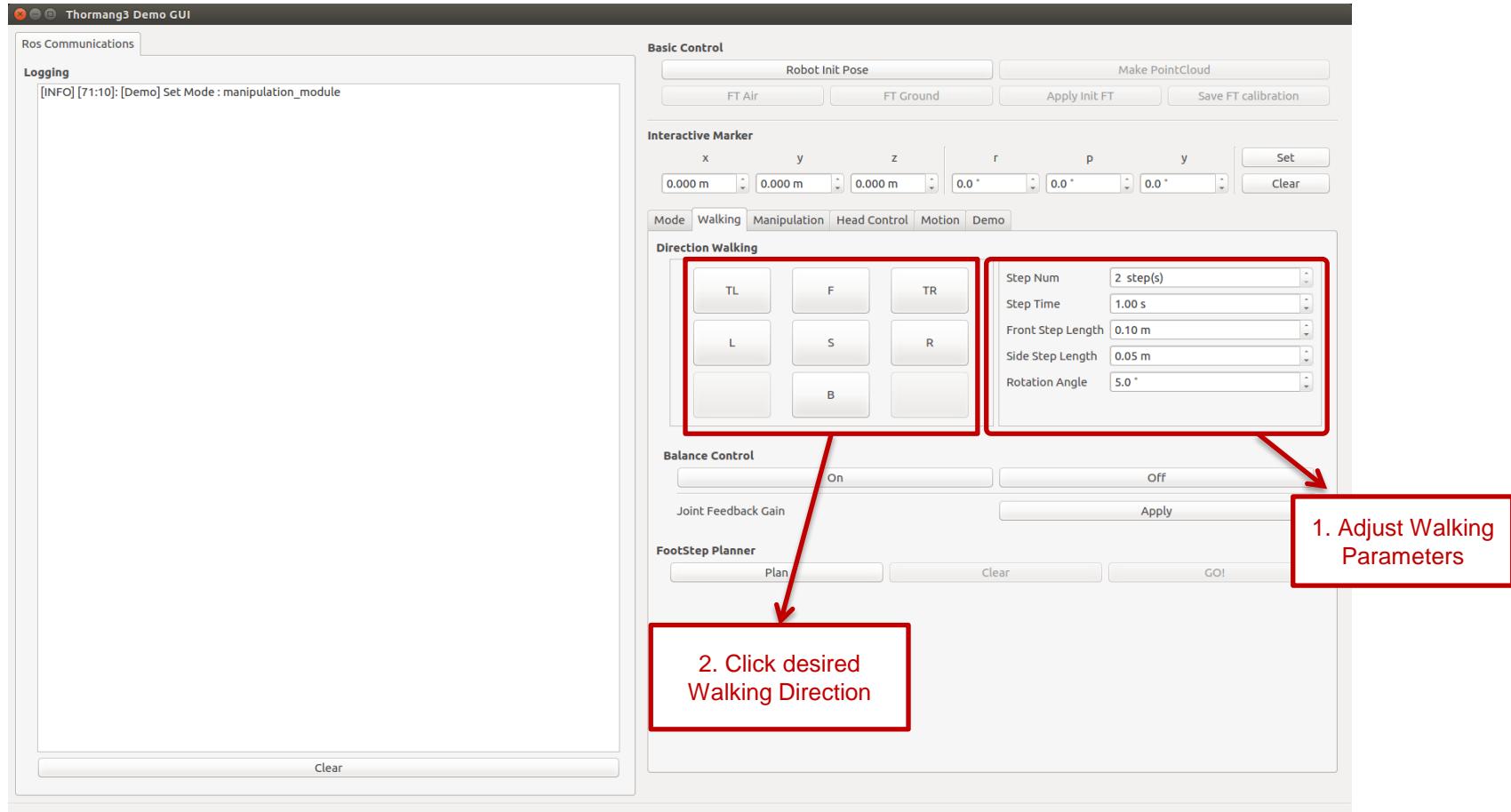


Walking Demo



4. Walking Demo

- Adjust Walking Parameters and Choose Walking Direction

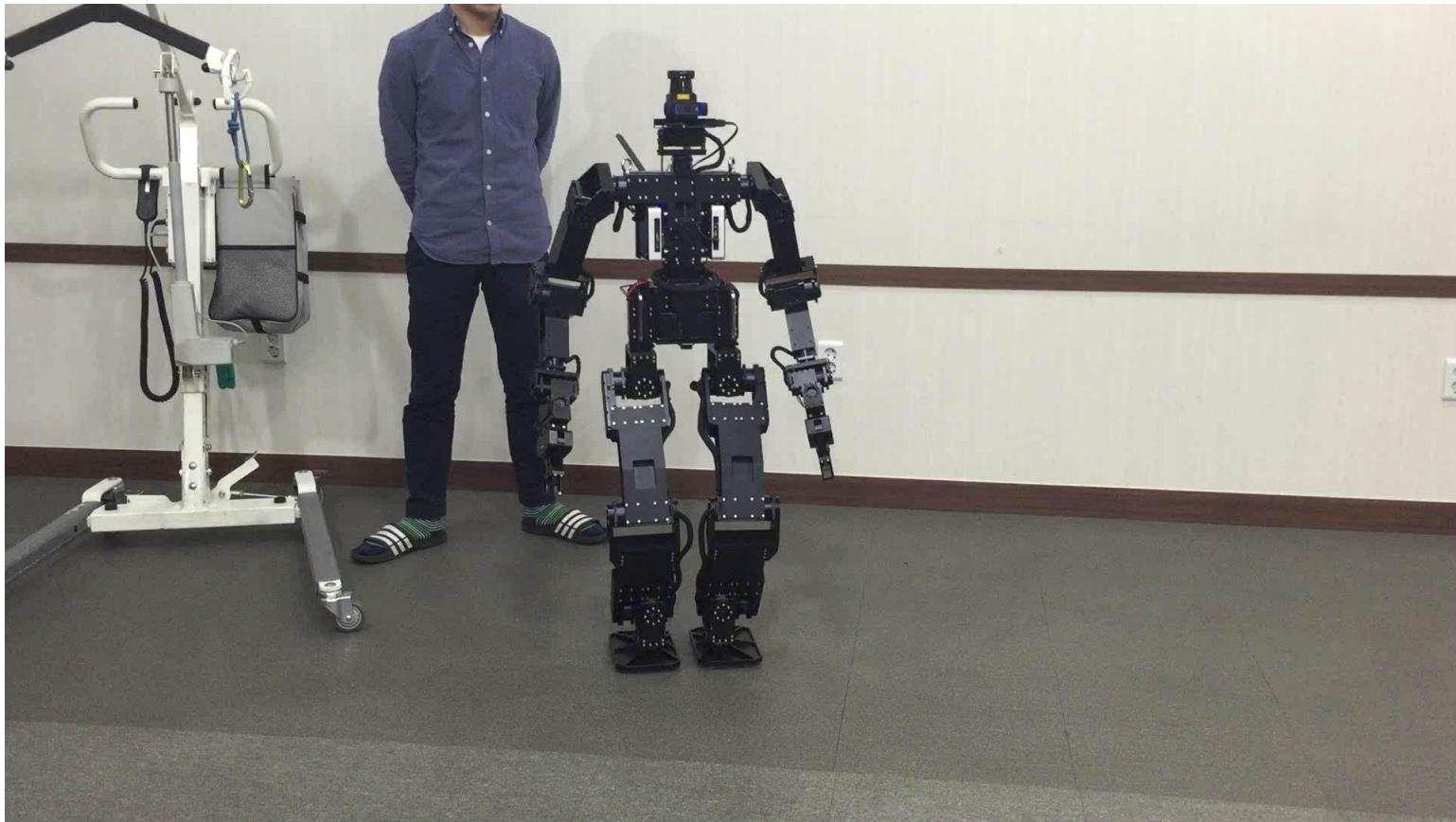




Walking Demo



4. Walking Demo



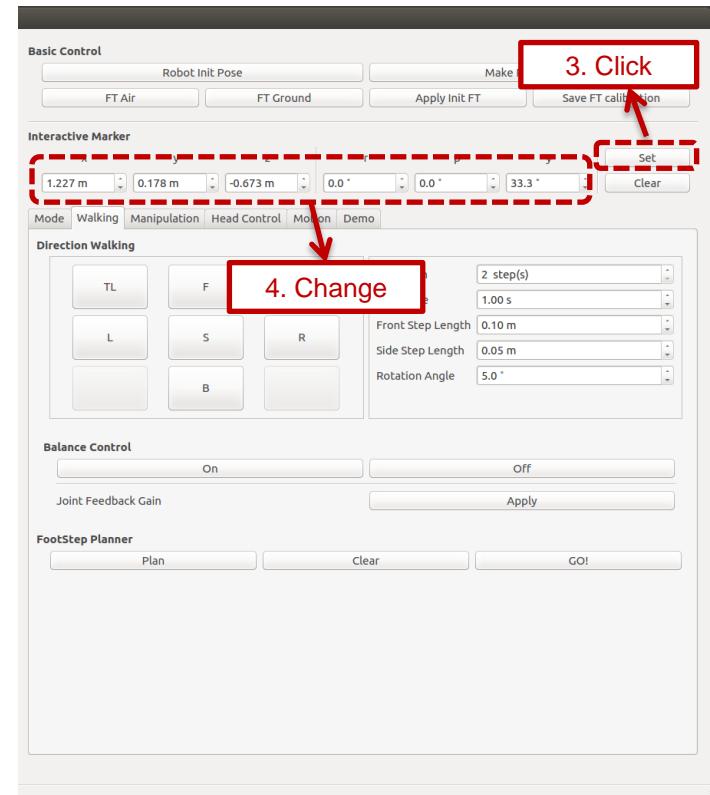
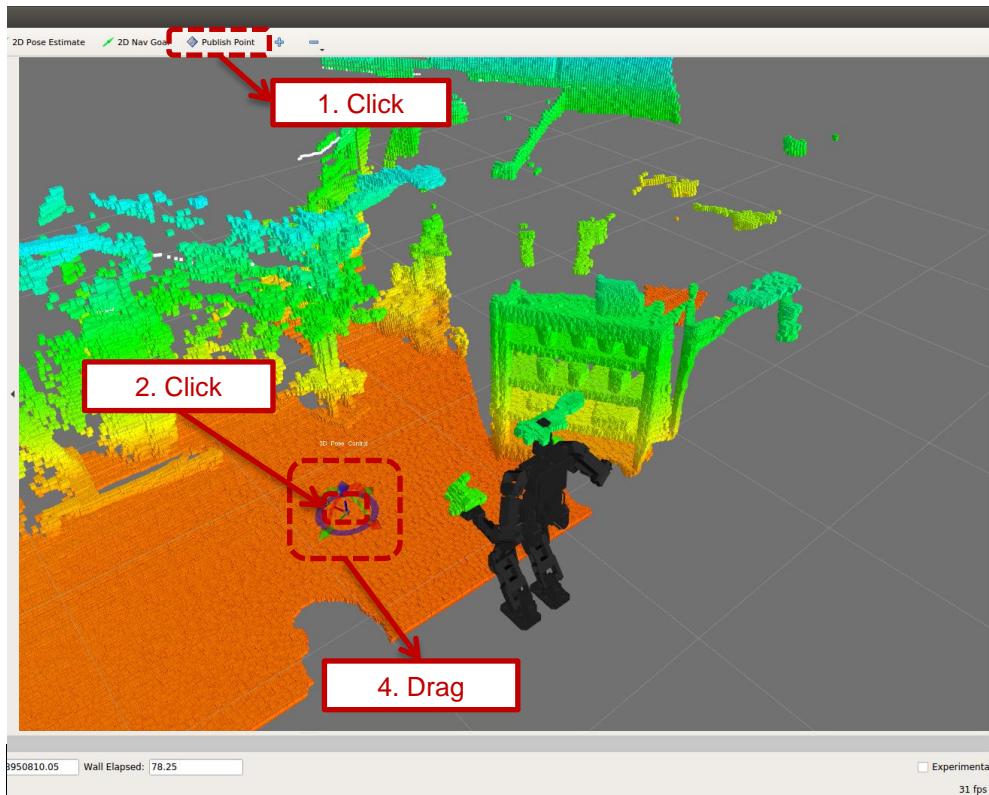


Walking Demo



4. Walking Demo

- Using [humanoid navigation\(footstep planner\)](#)
 - Setting the target pose using Interactive marker
 - Click 'publish point' button
 - Click the target or the base position
 - Click 'Set' button in GUI Demo
 - Drag the Interactive Marker or Change the value



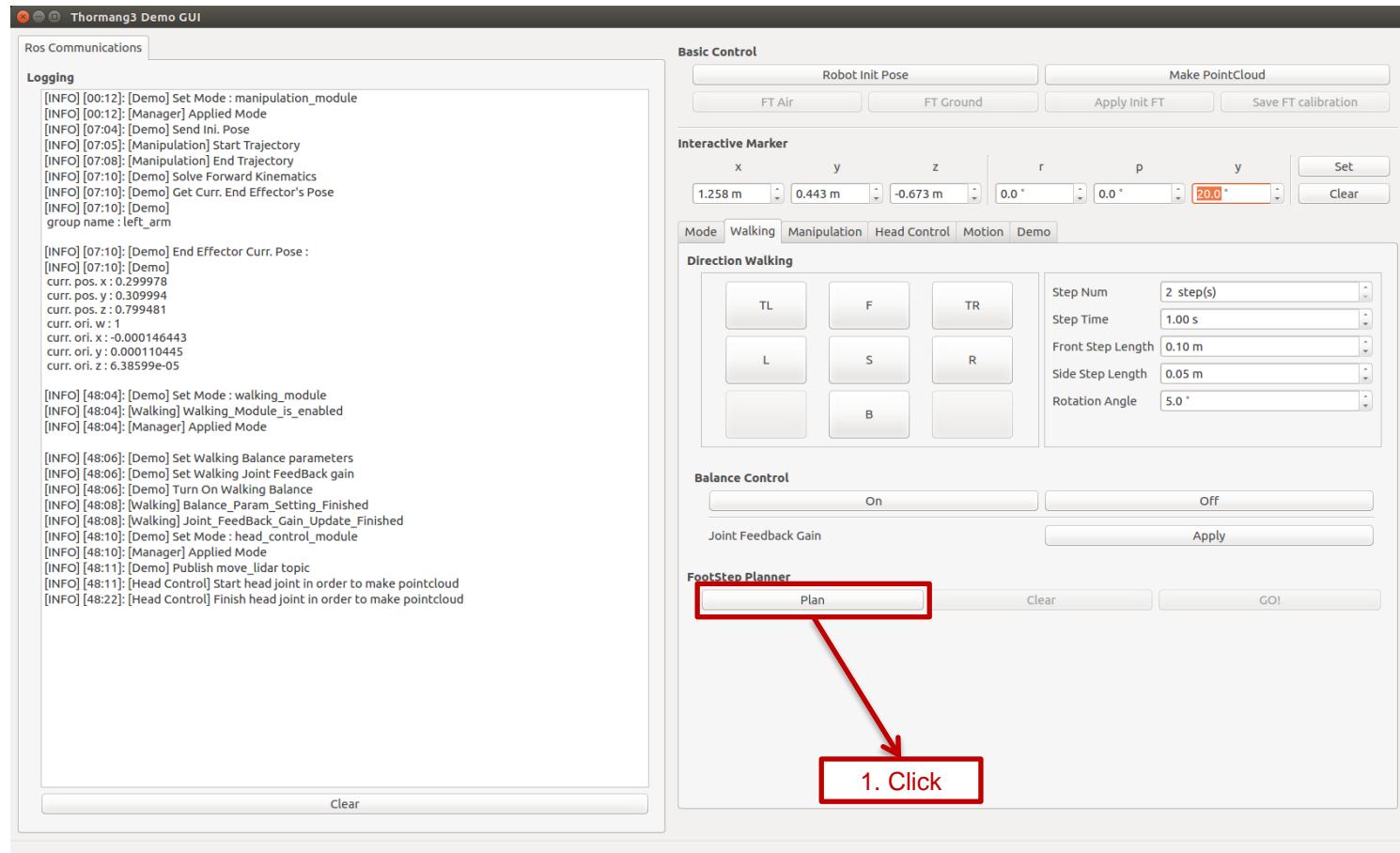


Walking Demo



4. Walking Demo

- Using [humanoid navigation\(footstep planner\)](#)
 - Planning the footsteps



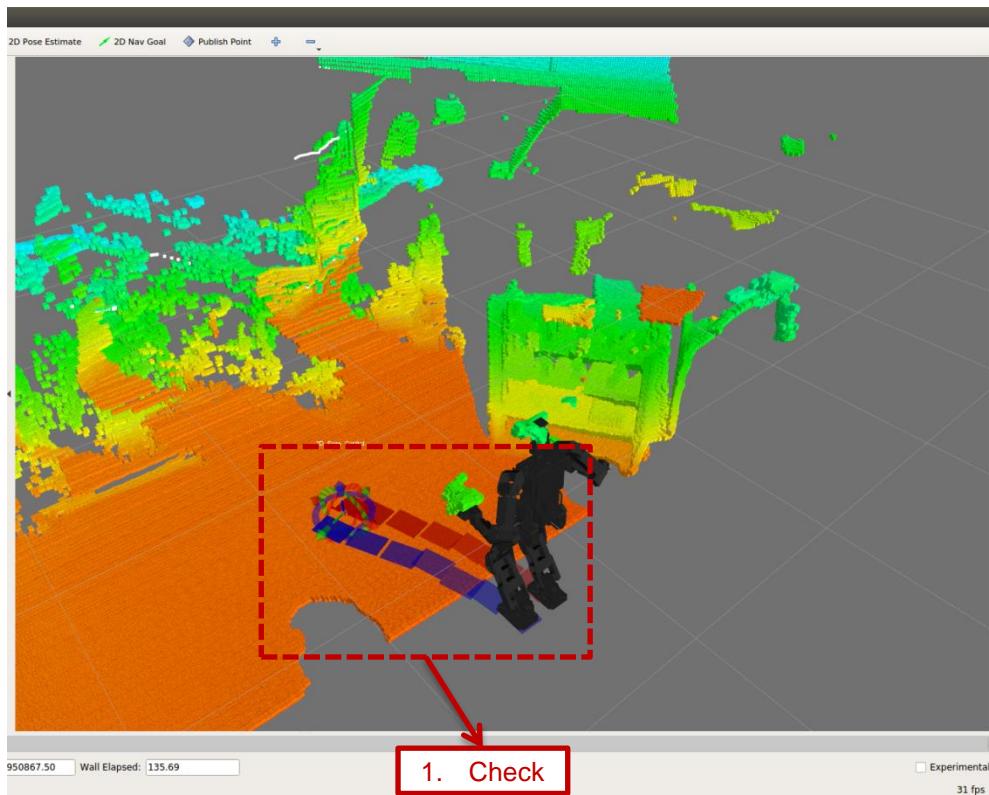


Walking Demo



4. Walking Demo

- Using humanoid navigation(footstep planner)
 - Checking the footsteps and Going to walk



Basic Control

Robot Init Pose Make PointCloud

FT Air FT Ground Apply Init FT Save FT calibration

Interactive Marker

x	y	z	r	p	y	Set
1.258 m	0.443 m	-0.673 m	0.0 °	0.0 °	20.0 °	Clear

Mode: Walking Manipulation Head Control Motion Demo

Direction Walking

TL	F	TR	Step Num: 2 step(s)
L	S	R	Step Time: 1.00 s
	B		Front Step Length: 0.10 m
			Side Step Length: 0.05 m
			Rotation Angle: 5.0 °

Balance Control

On Off

Joint Feedback Gain Apply

FootStep Planner

Plan Clear GO!

2. Click