

**THORMANG3**

# THORMANG3

## Tutorial

Demo



## Head Control Module – Lidar Scan –



# Demo Contents



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  - Balance
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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 -u` -2 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

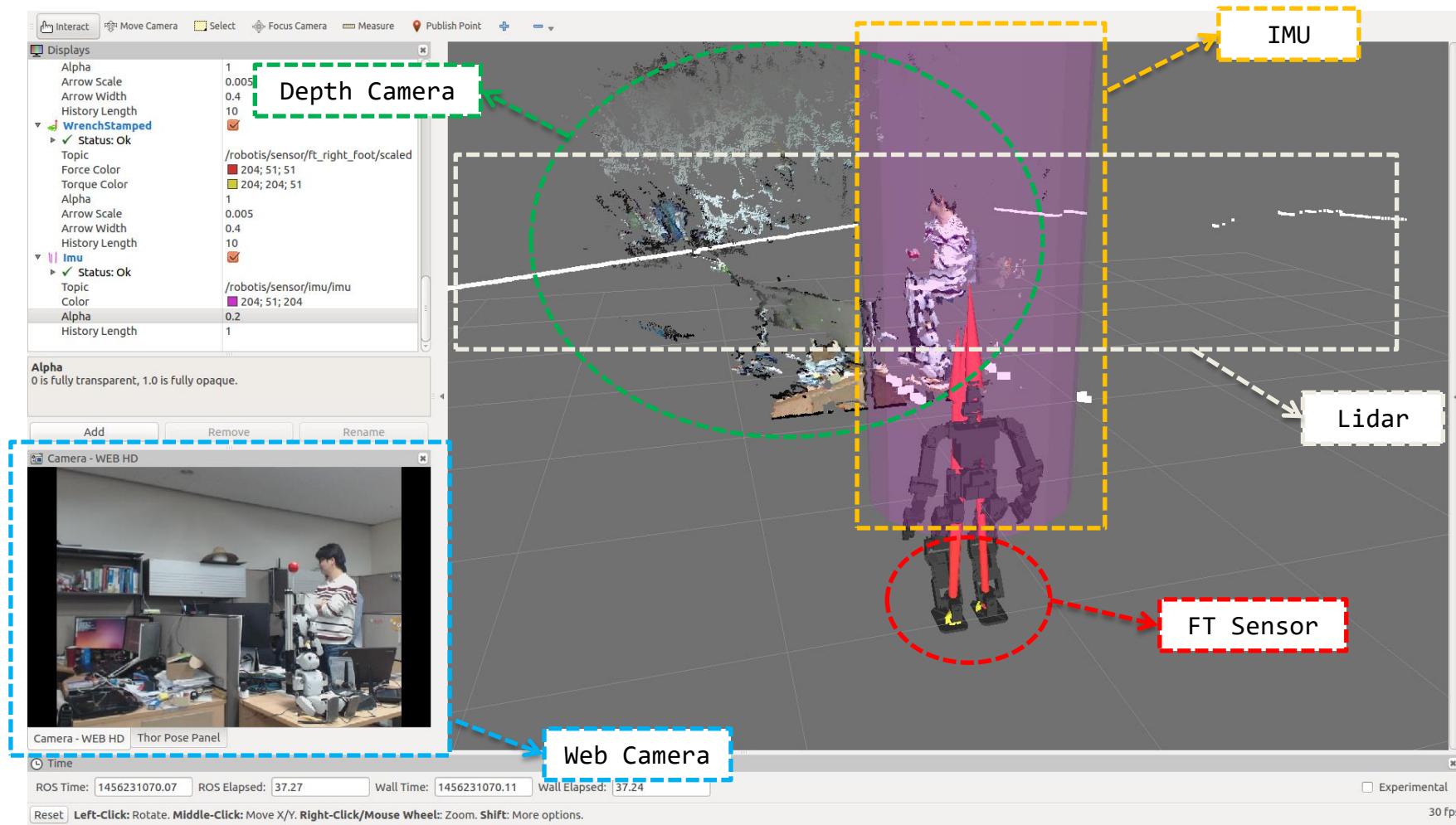
Clear



# 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**



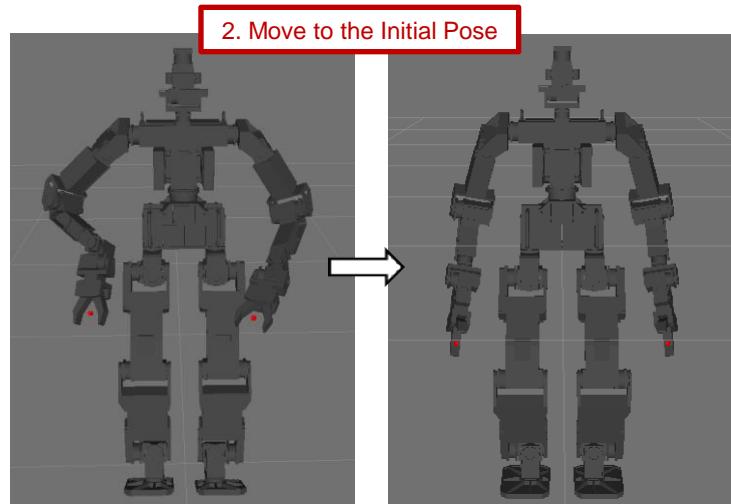
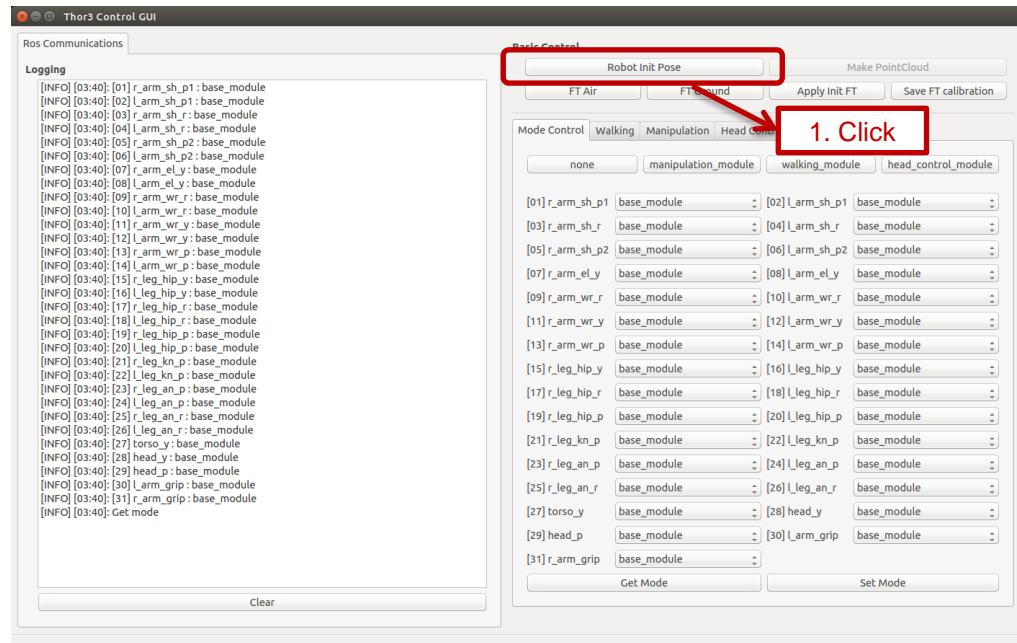
# Basic Demo



## 1. Basic Demo

### Initial Pose

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



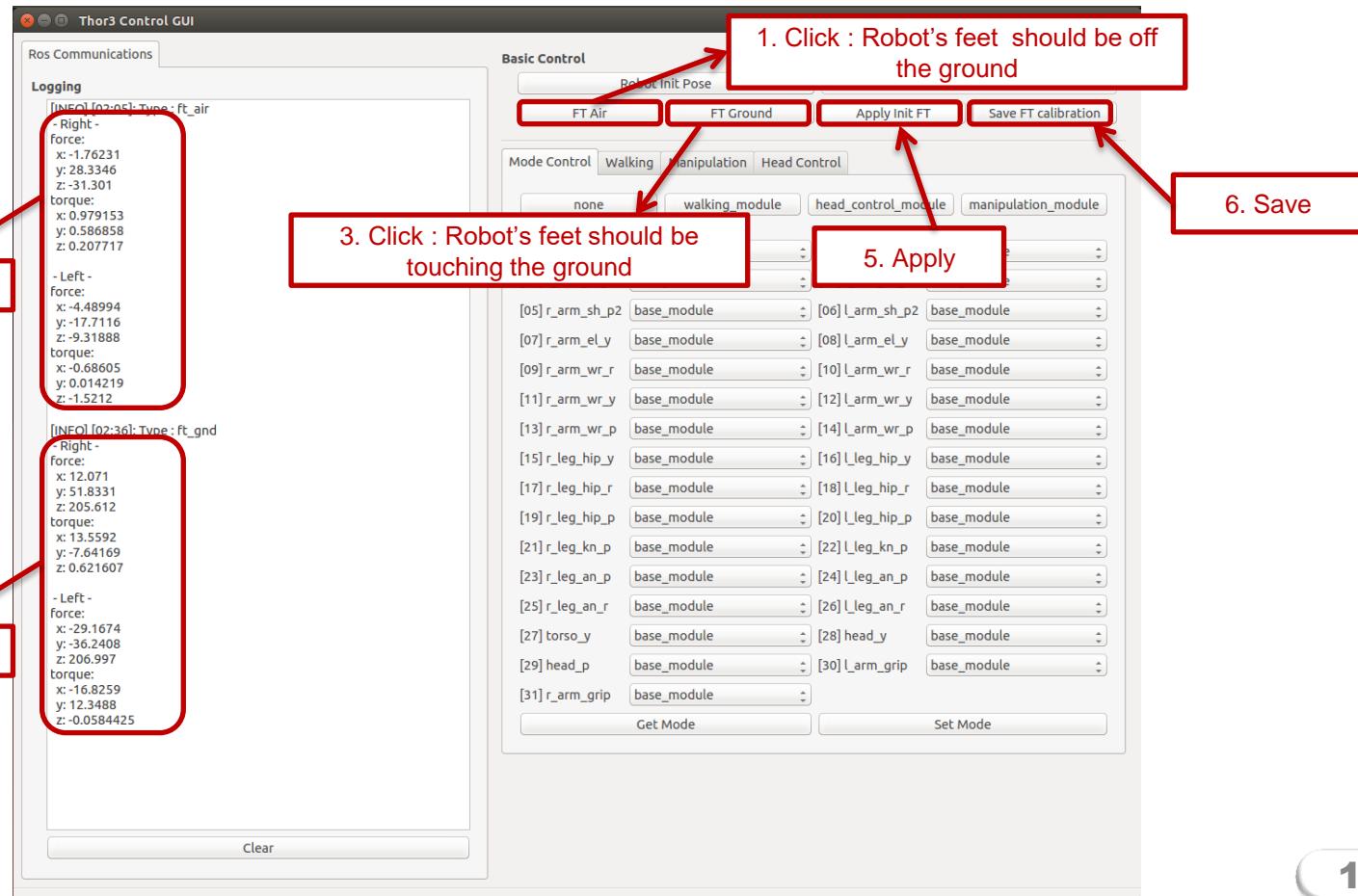


# Basic Demo



## 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.)



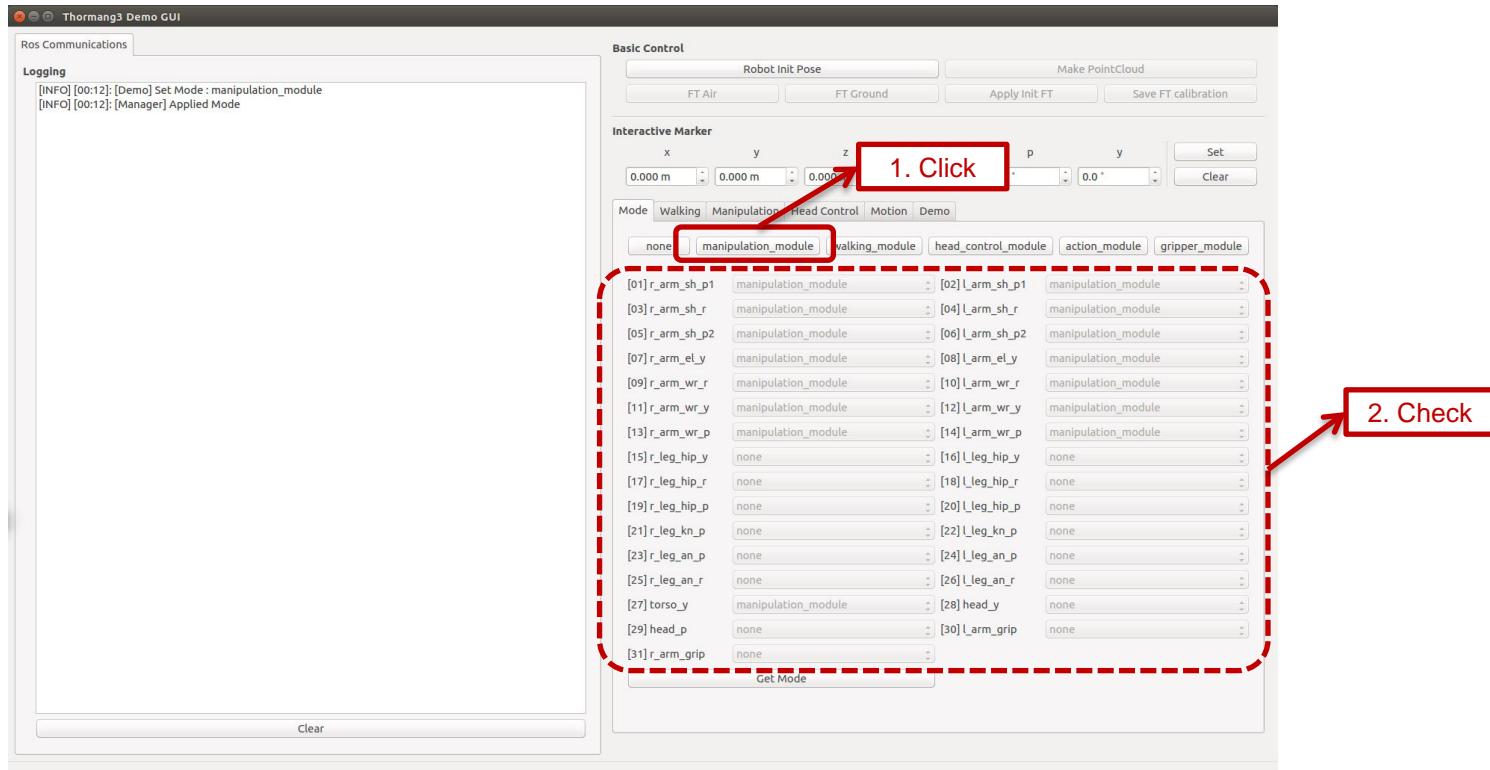


# Basic Demo



## 1. Basic Demo

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



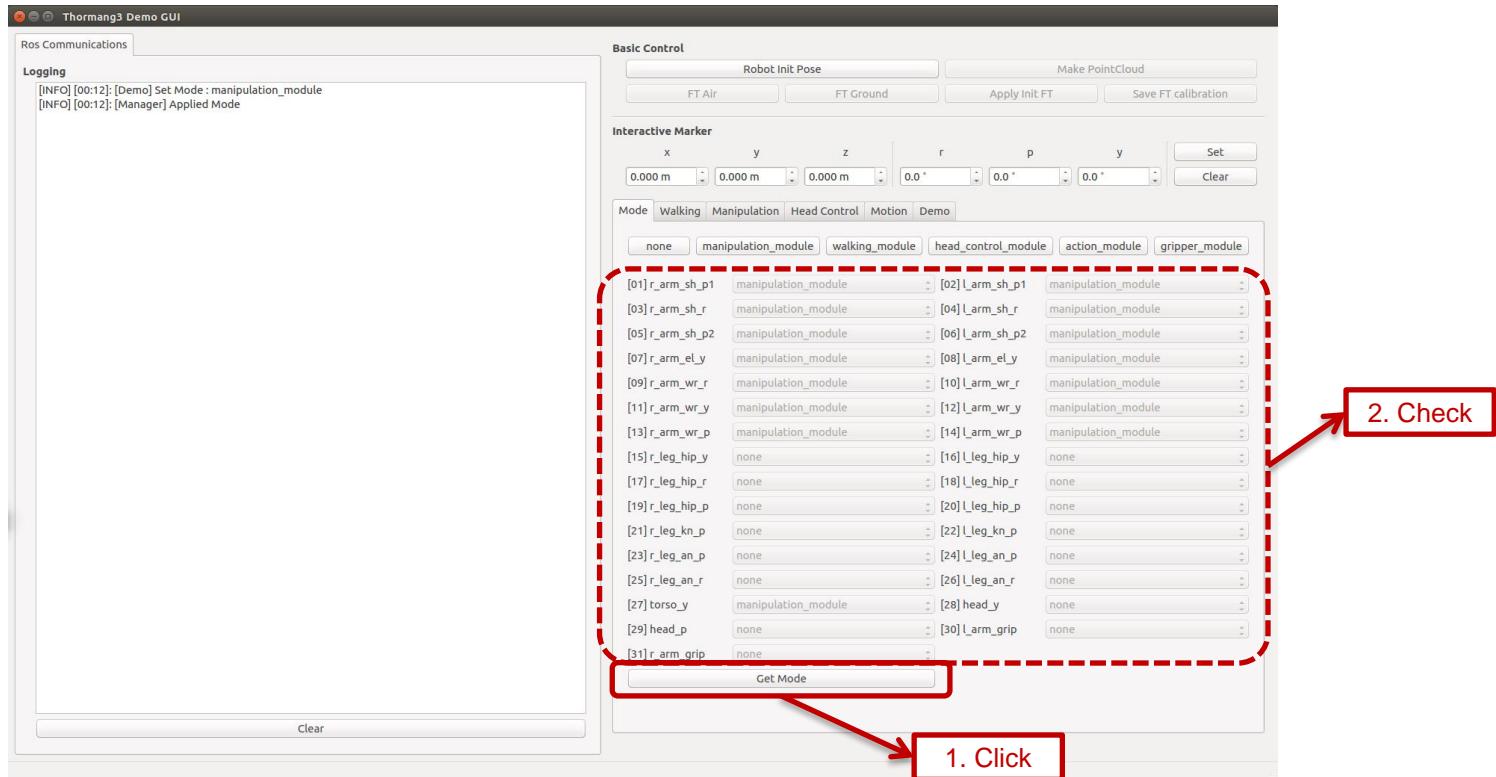


# Basic Demo



## 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**



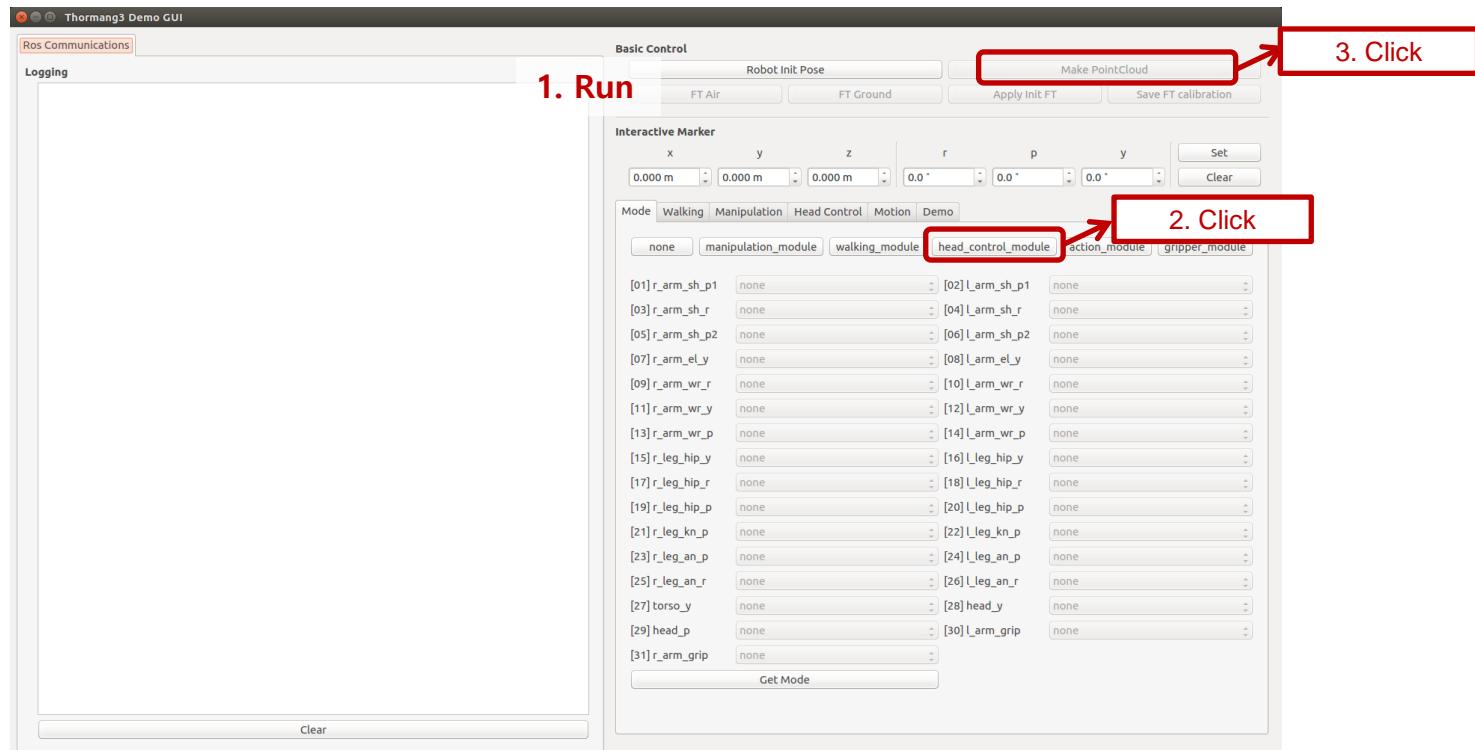
# Head Control Demo



## 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



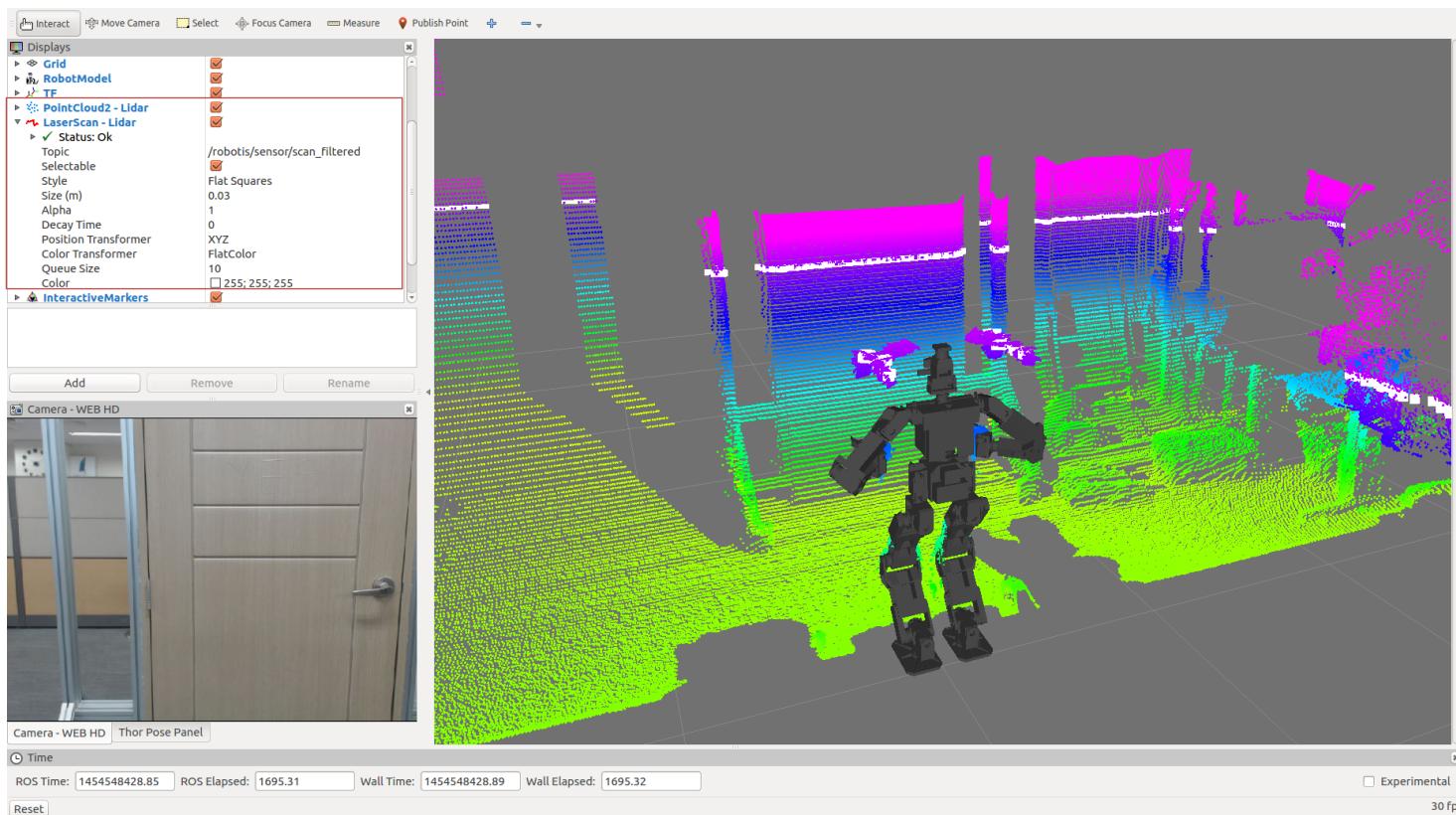


# Head Control Demo



## 2. Head Control Demo

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



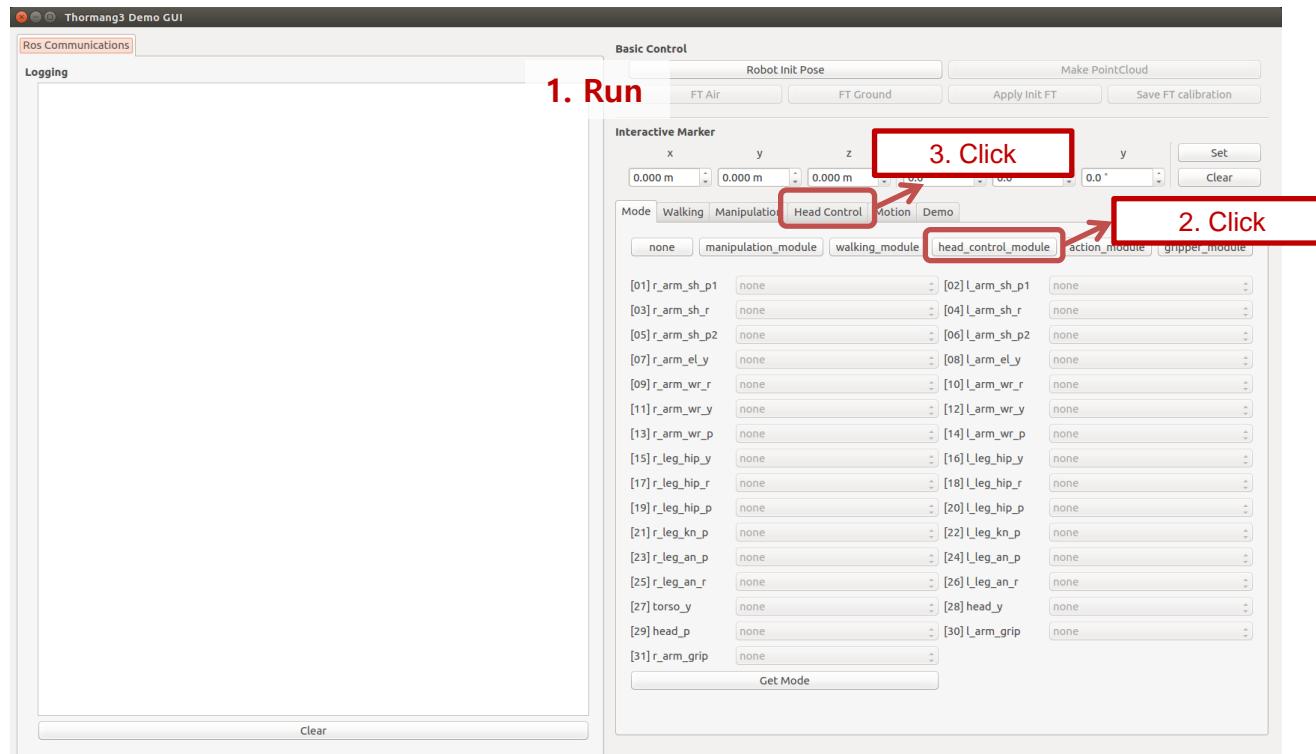


# Head Control Demo



## 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**'



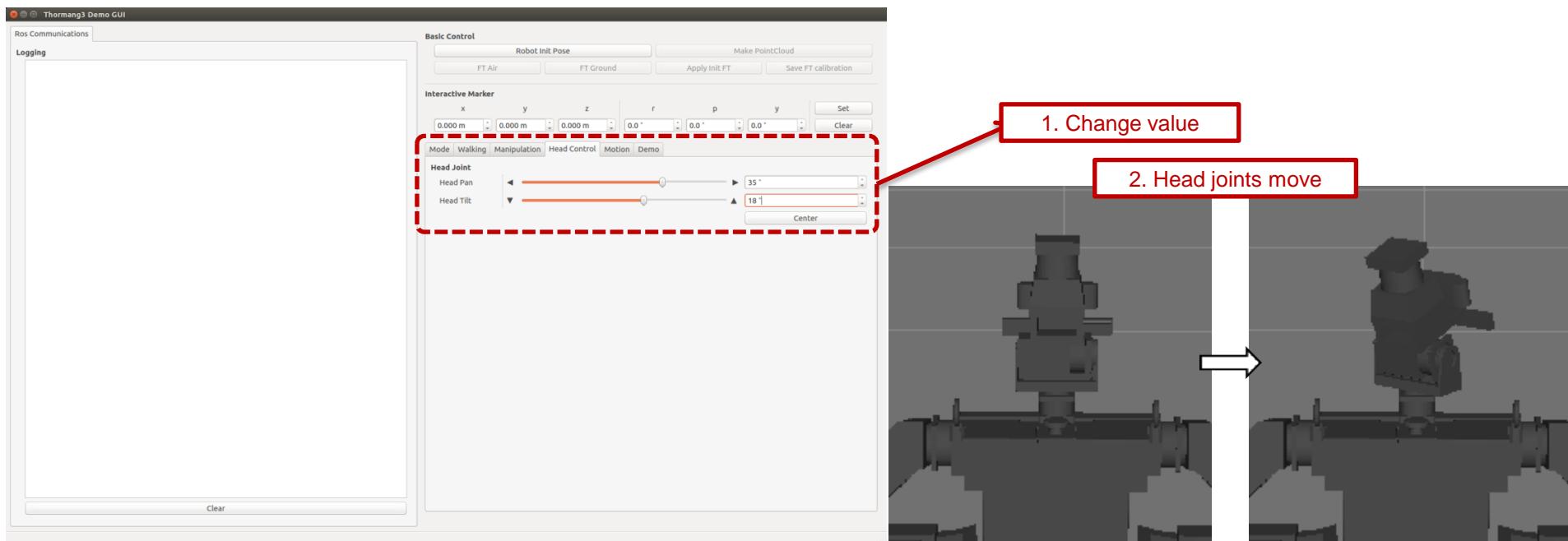


# Head Control Demo



## 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**

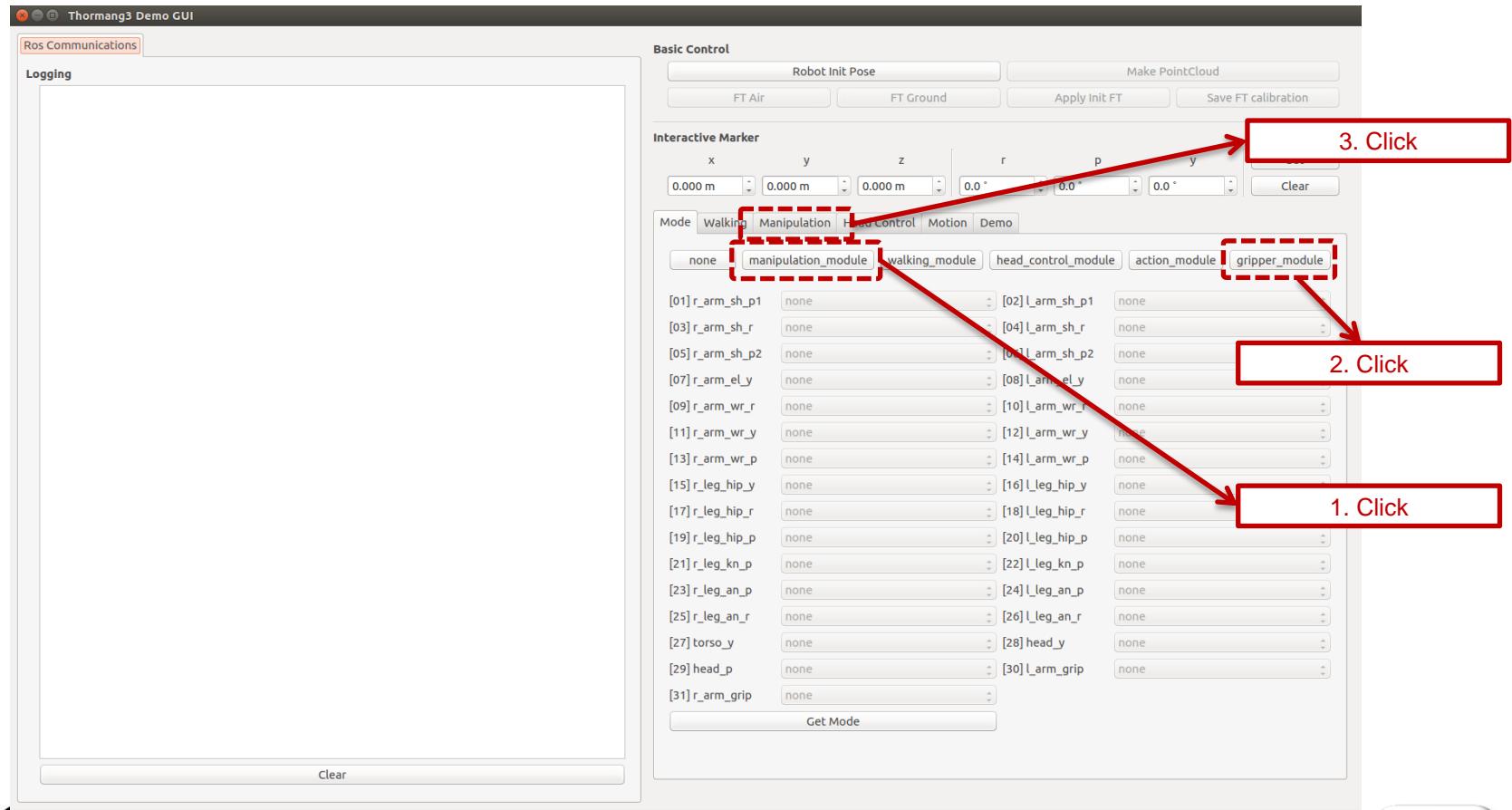


# Manipulation Demo



## 3. Manipulation Demo

- Set Module : manipulation\_module, gripper\_module
- Go to the manipulation tab



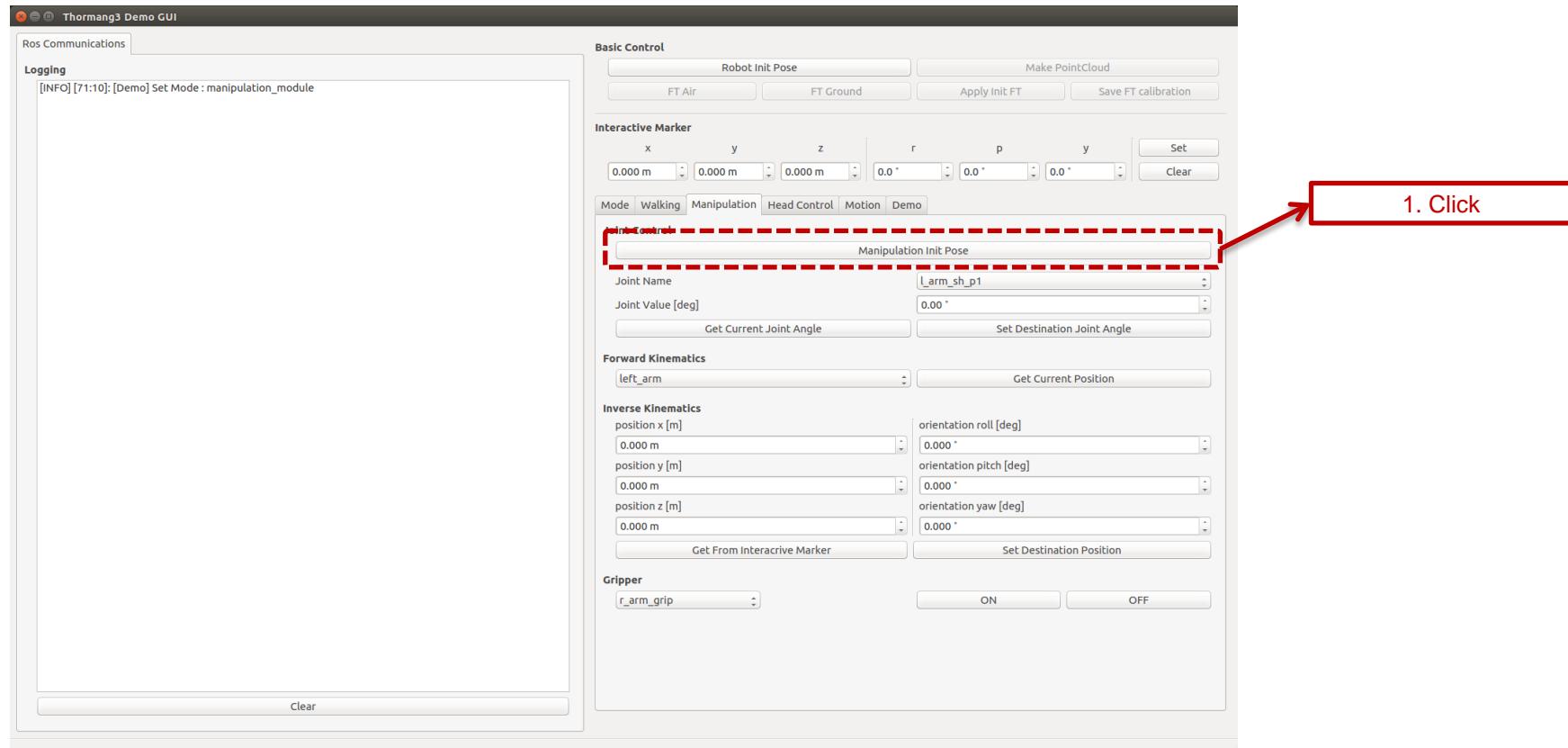


# Manipulation Demo



## 3. Manipulation Demo

- Manipulation Initial Pose
  - Click '**Manipulation Init\_Pose**'



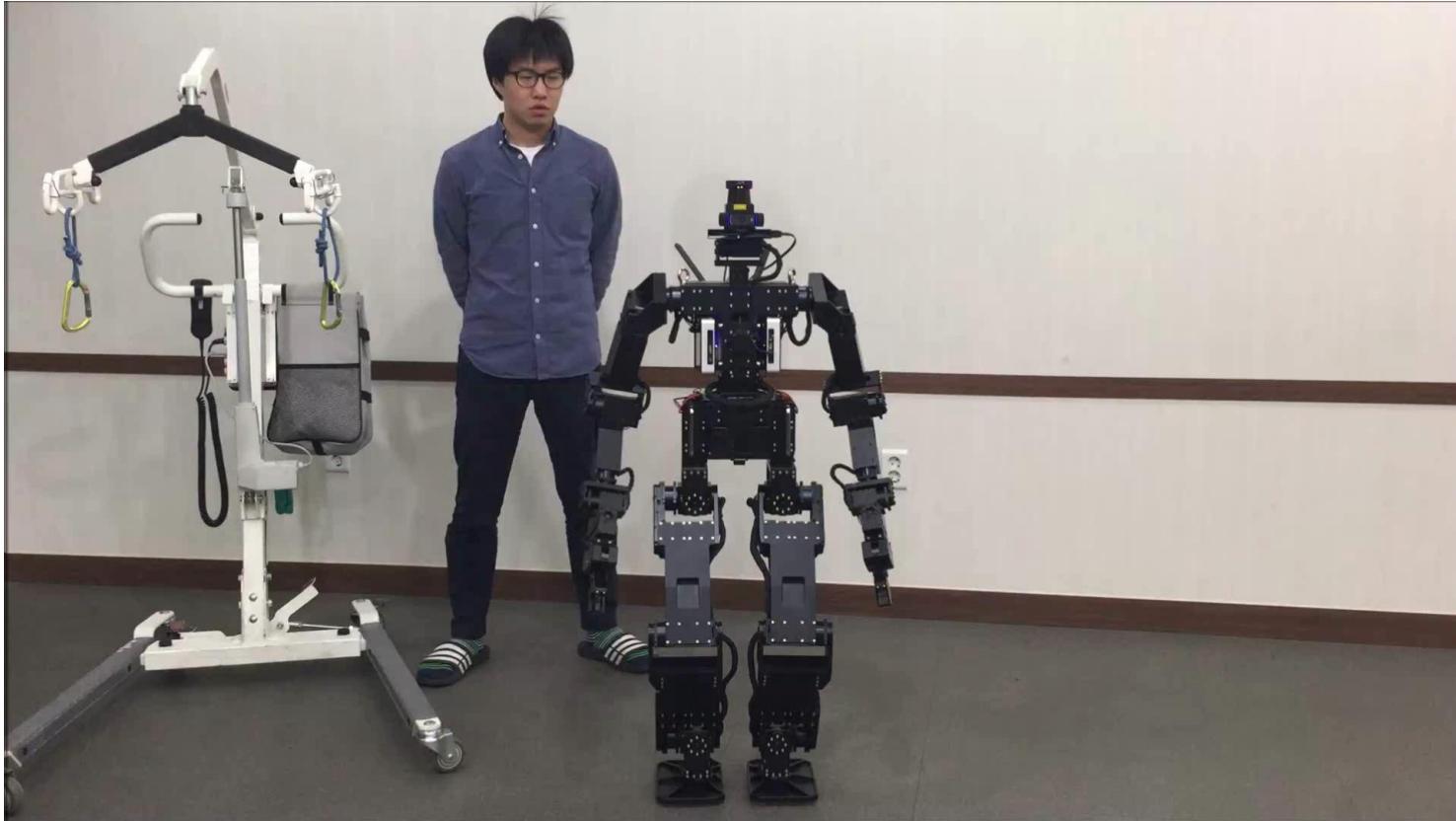


# Manipulation Demo



## 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'. Below it, the 'Joint Value [deg]' input field contains '0.00 \*'. To the right of the input field are two buttons: 'Get Current Joint Angle' and 'Set Destination Joint Angle'. A red dashed box encloses both the 'Joint Name' dropdown and the 'Joint Value' input field. A red arrow points from this box to a list of joint names on the right. Another red arrow points from the list to a callout box labeled '1. Select'. A third red arrow points from the list to a callout box labeled '3. Read Value'. A fourth red arrow points from the list to a callout box labeled '2. Click'.

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

3. Read Value

2. Click



# Manipulation Demo



## 3. Manipulation Demo

- Joint Space Control
- 2. Write desired joint angle

Thormang3 Demo GUI

Ros Communications

Logging  
[INFO] [71:10]:[Demo] Set Mode : manipulation\_module

Basic Control

Robot Init Pose      Make PointCloud

FT Air      FT Ground      Apply Init FT      Save FT calibration

Interactive Marker

Joint Control

Manipulation Init Pose

Joint Name: L\_arm\_sh\_p1 (1)

Joint Value [deg]: 0.00° (2)

Get Current Joint Angle      Set Destination Joint Angle (3)

Forward Kinematics

left\_arm

Inverse Kinematics

position x [m]: 0.000 m

position y [m]: 0.000 m

position z [m]: 0.000 m

orientation roll [deg]: 0.000 °

orientation pitch [deg]: 0.000 °

orientation yaw [deg]: 0.000 °

Get From Interactive Marker      Set Destination Position

Gripper

L\_arm\_grip

ON      OFF

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

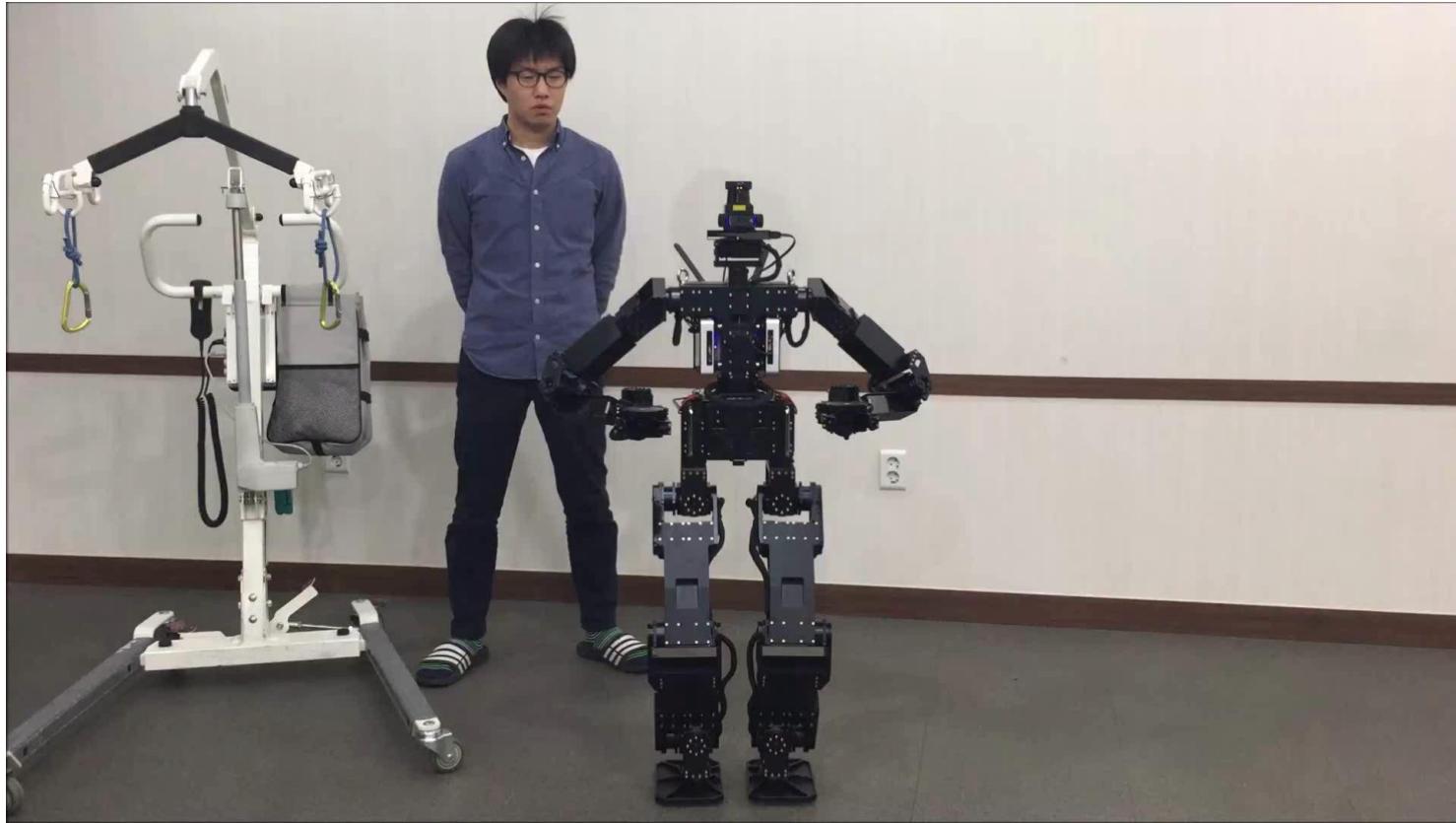


# Manipulation Demo



## 3. Manipulation Demo

- Joint Space Control Video



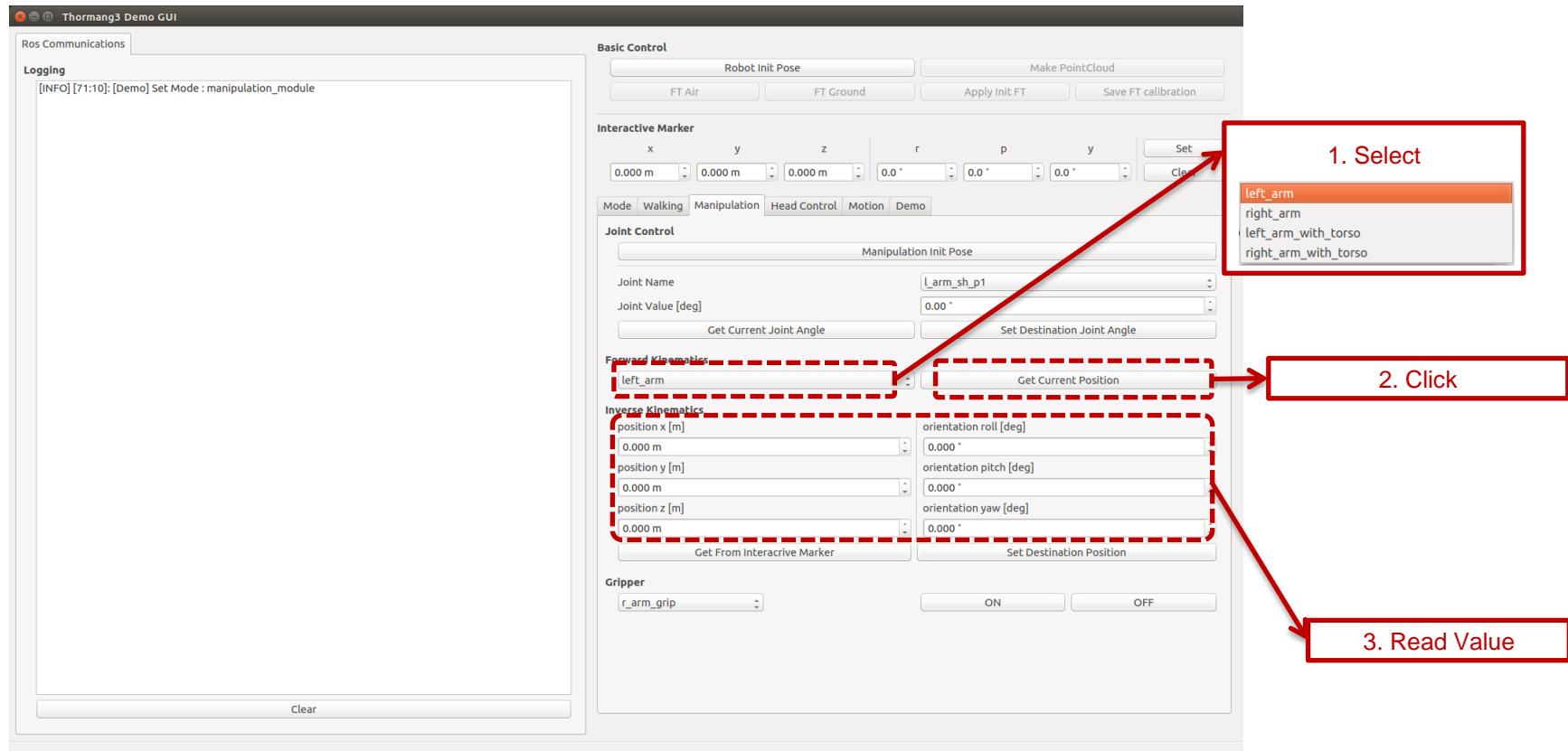


# Manipulation Demo



## 3. Manipulation Demo

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



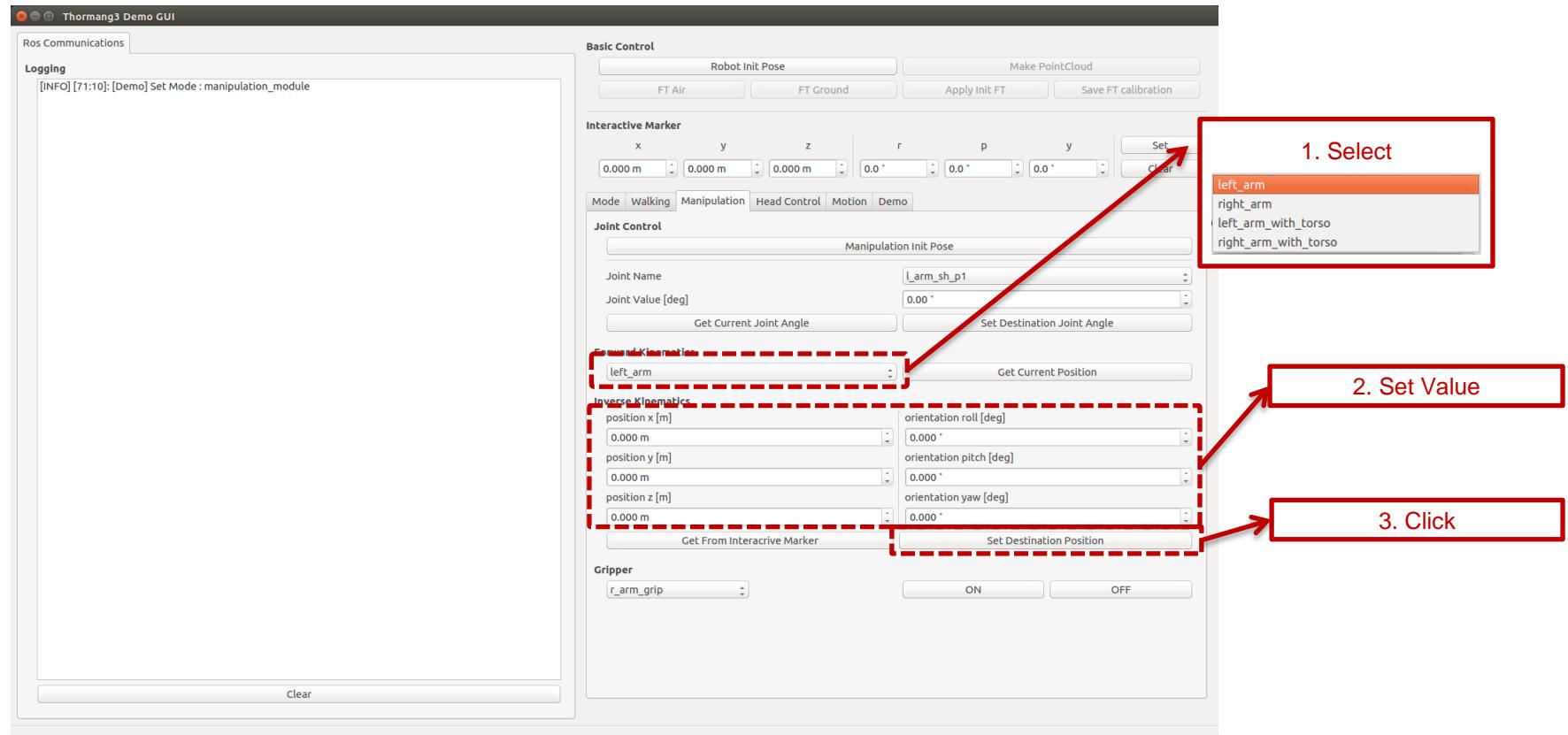


# Manipulation Demo



## 3. Manipulation Demo

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



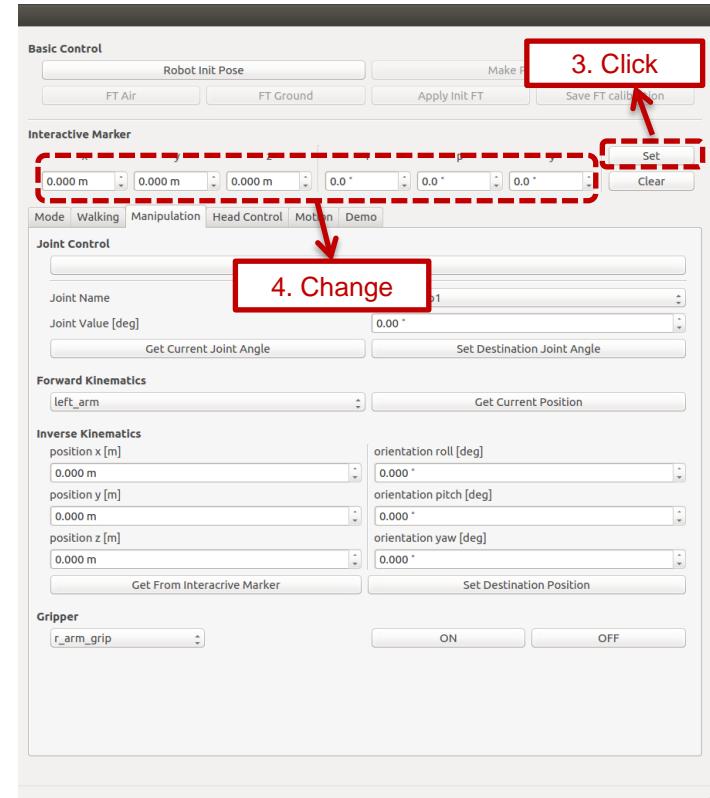
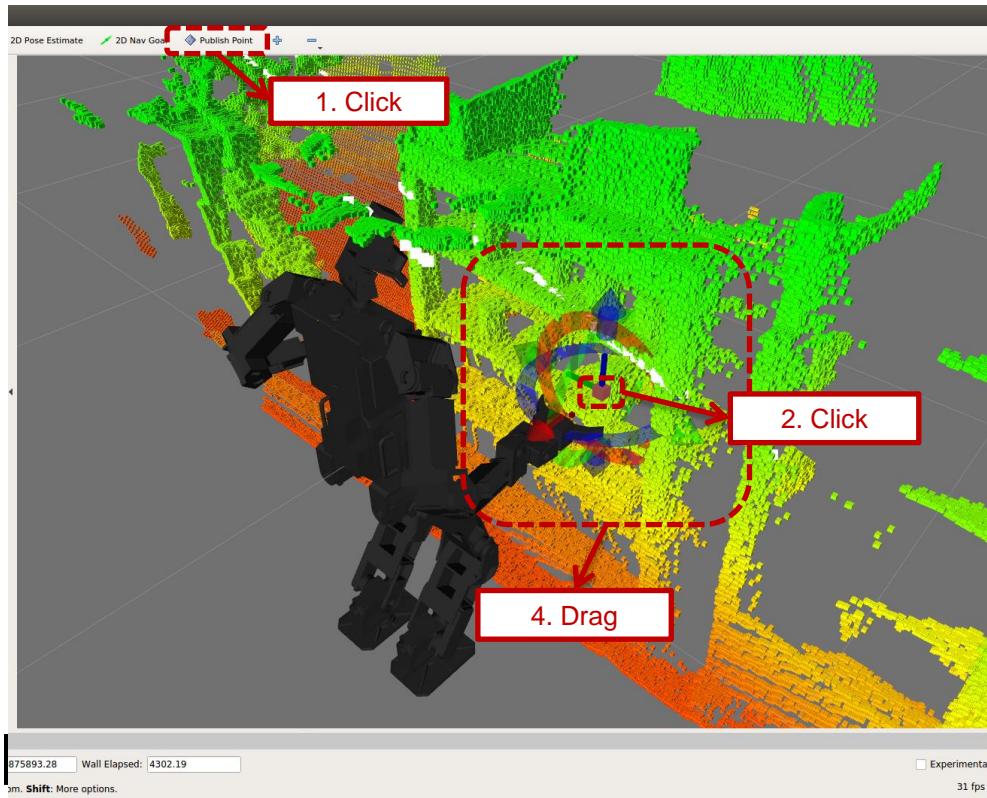


# Manipulation Demo



## 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



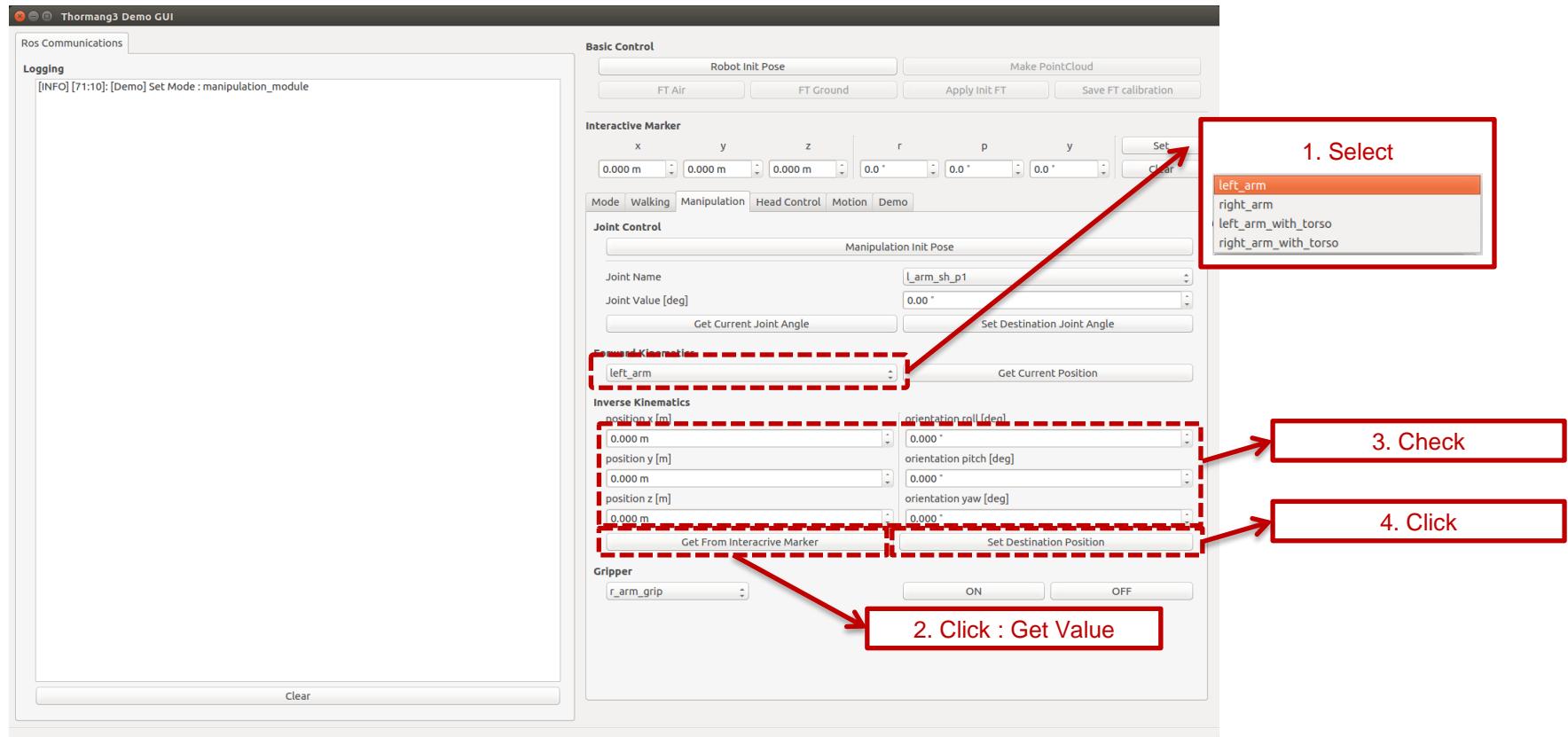


# Manipulation Demo



## 3. Manipulation Demo

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



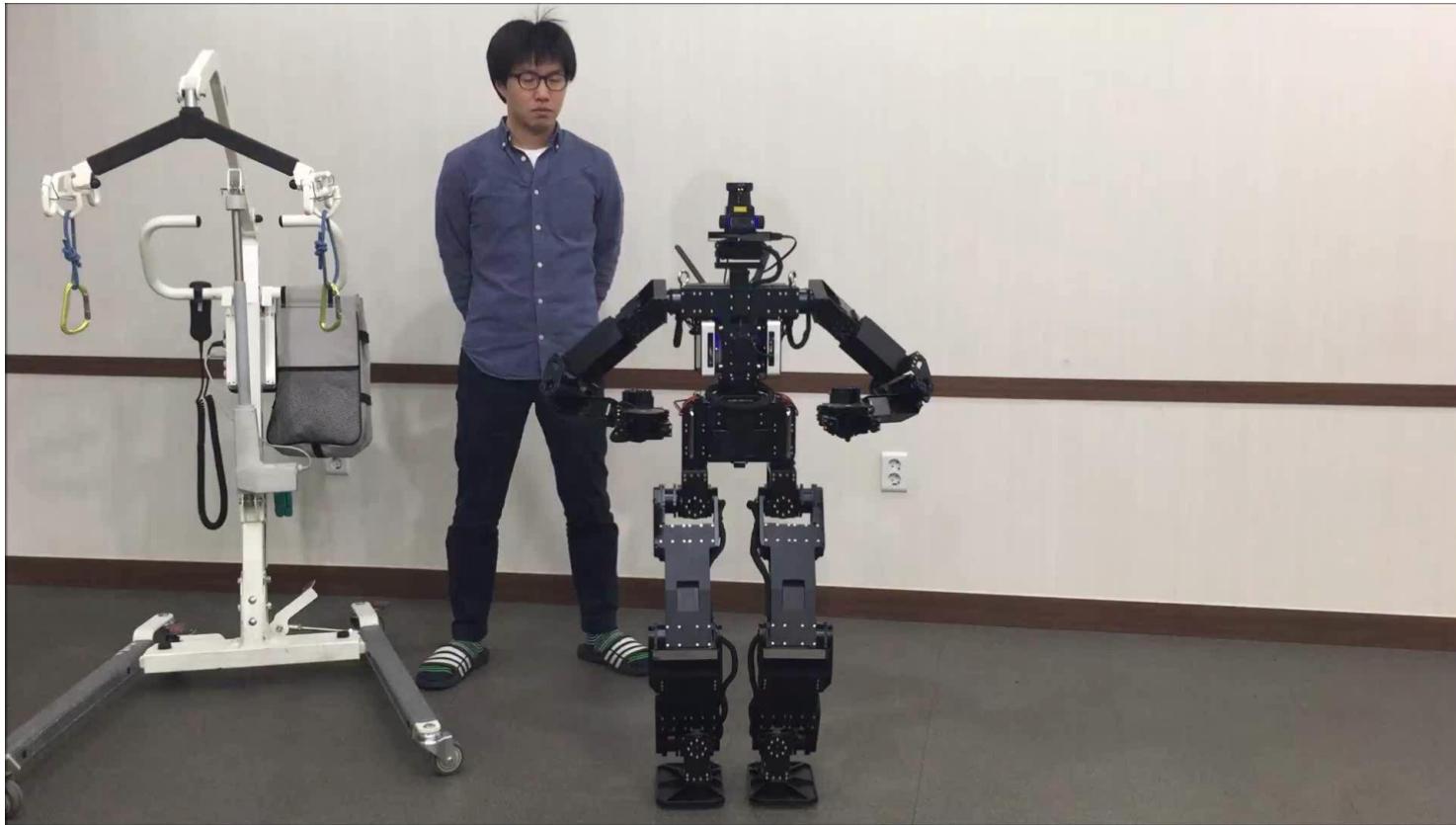


# Manipulation Demo



## 3. Manipulation Demo

- Task Space Control Video



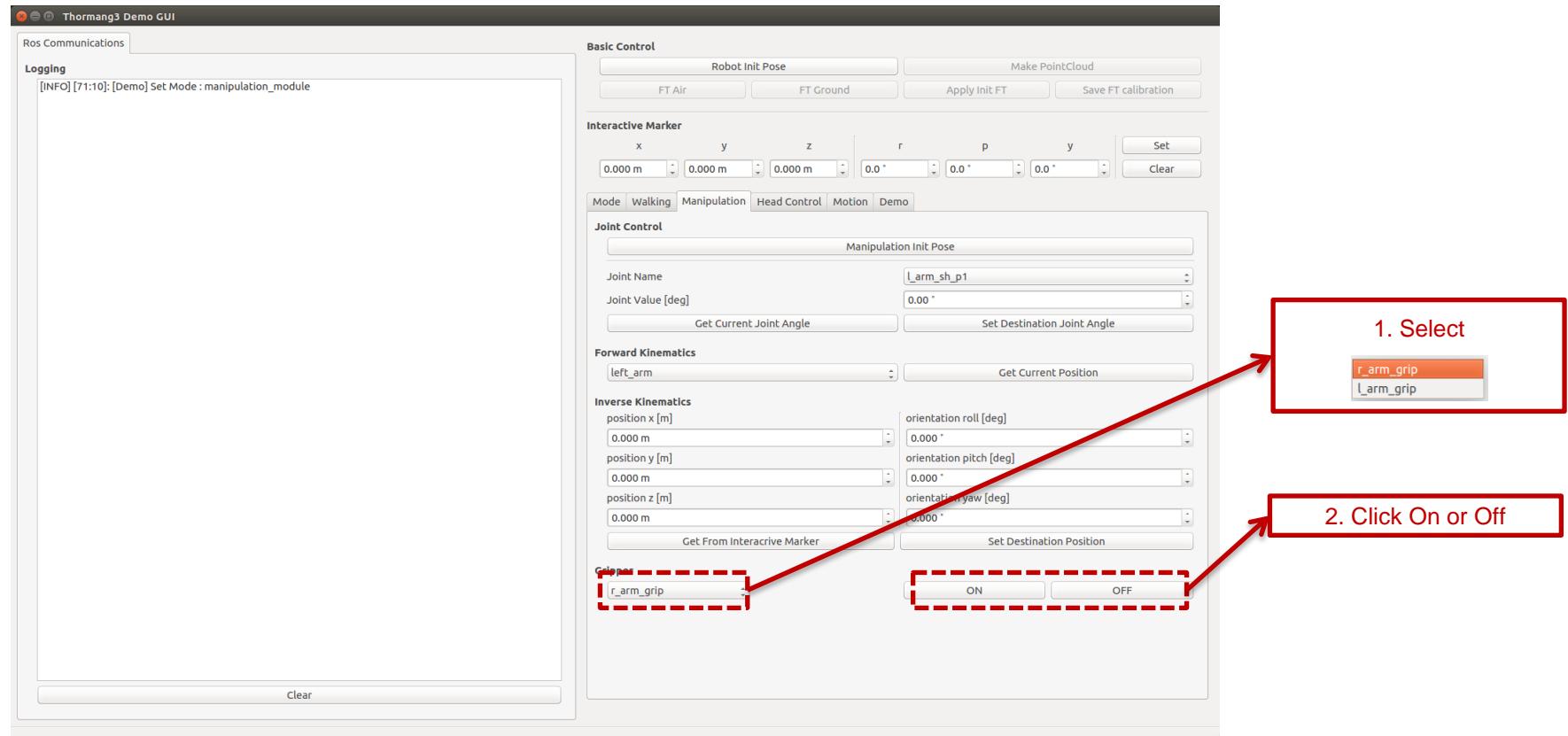


# Manipulation Demo



## 3. Manipulation Demo

- Gripper On/Off (Closed/Open)



# Walking Demo



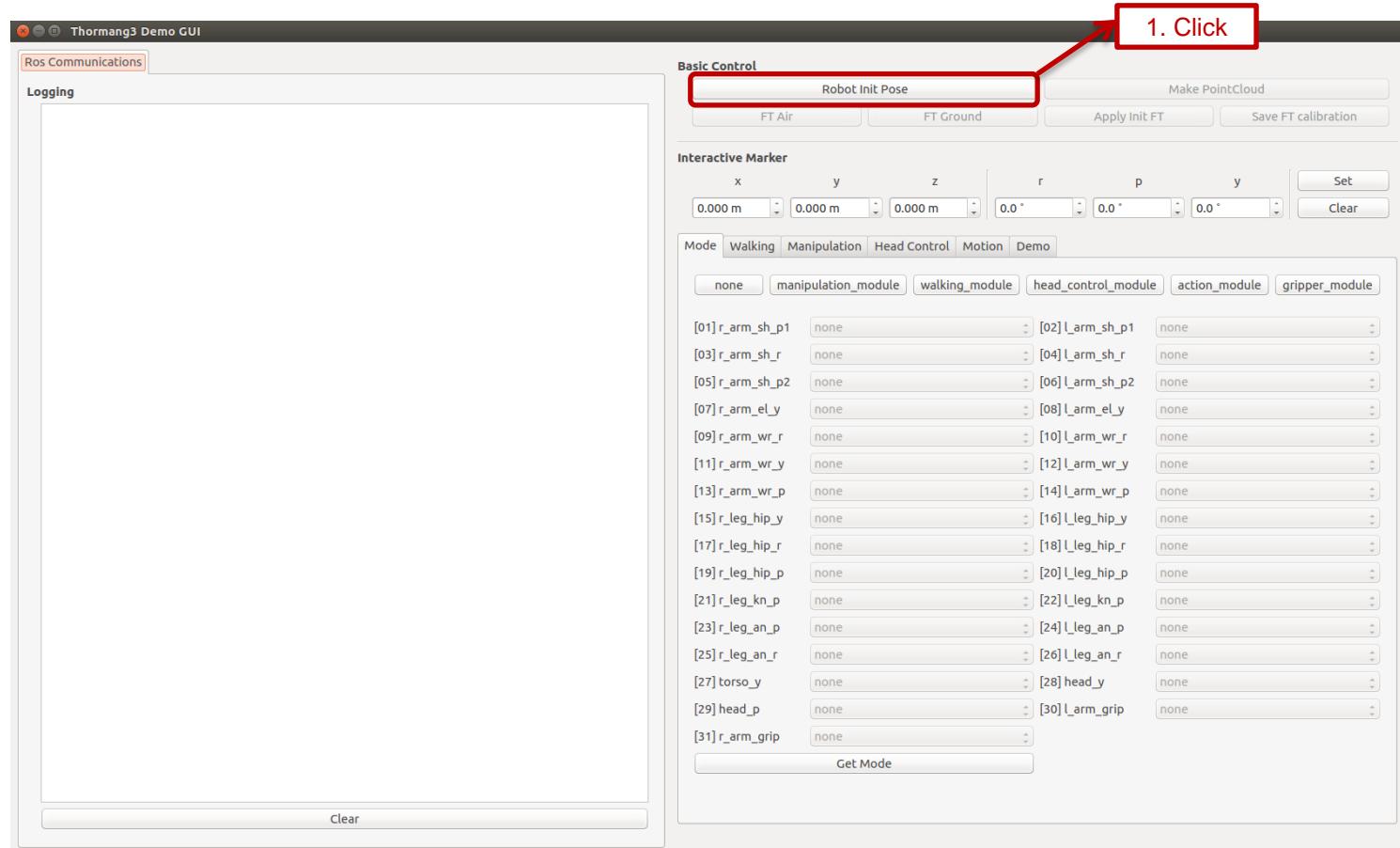
# Walking Demo



## 4. Walking Demo

- Initial Pose

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





# Walking Demo



## 4. Walking Demo



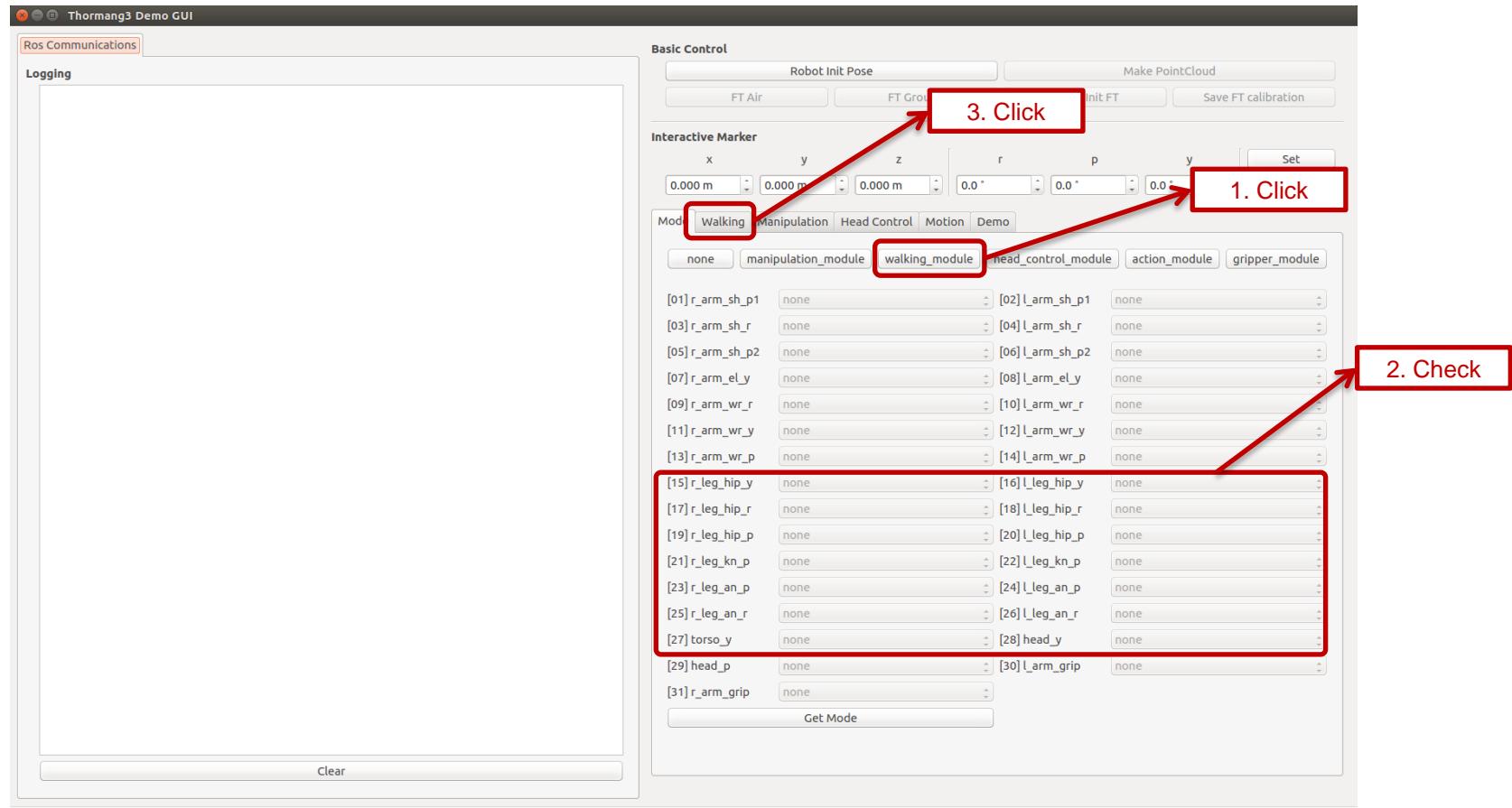


# Walking Demo



## 4. Walking Demo

- Set Module : click 'walking\_module' button
- Go to the Walking tab



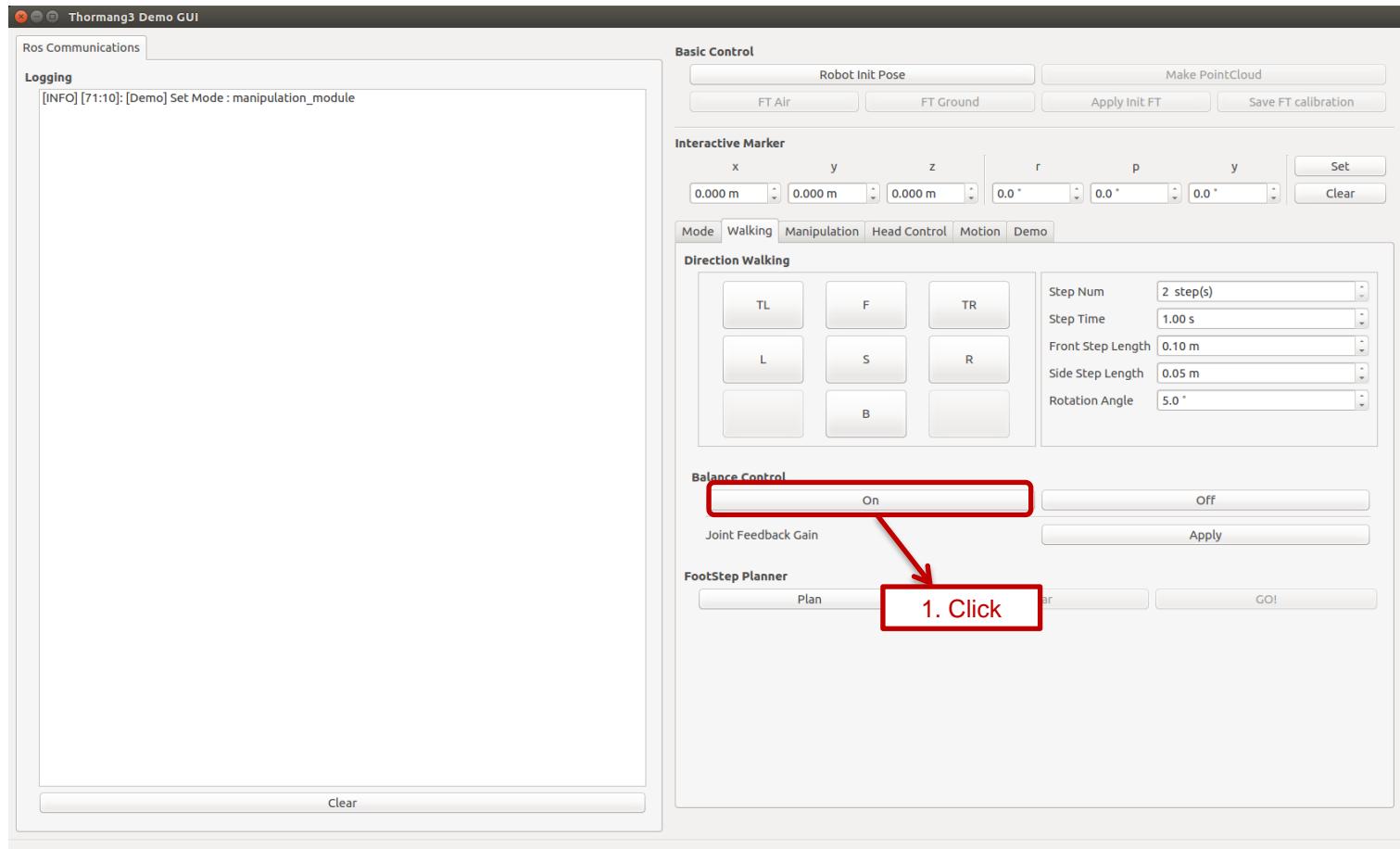


# Walking Demo



## 4. Walking Demo

- Balance THORMANG



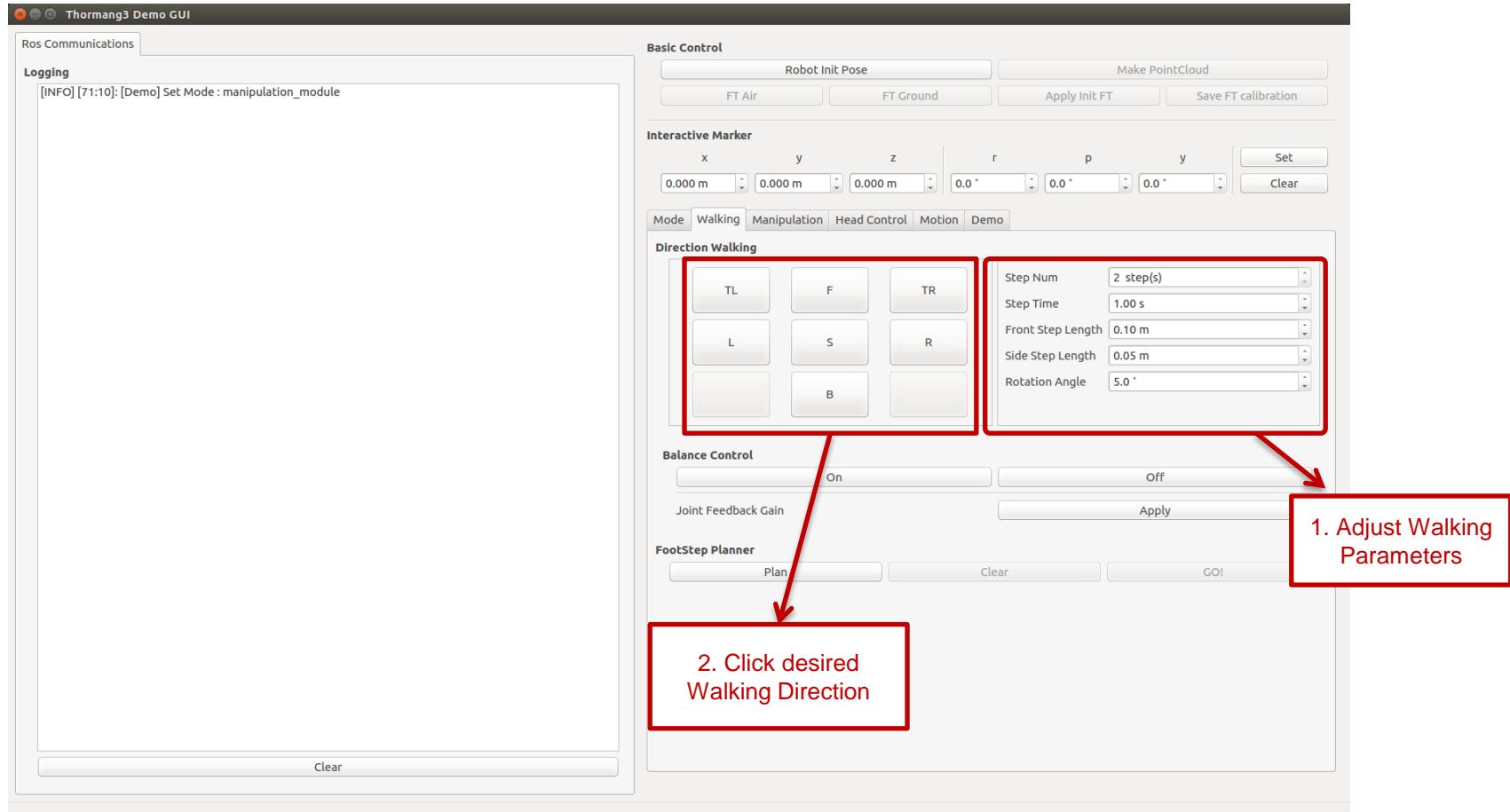


# Walking Demo



## 4. Walking Demo

- Adjust Walking Parameters and Choose Walking Direction

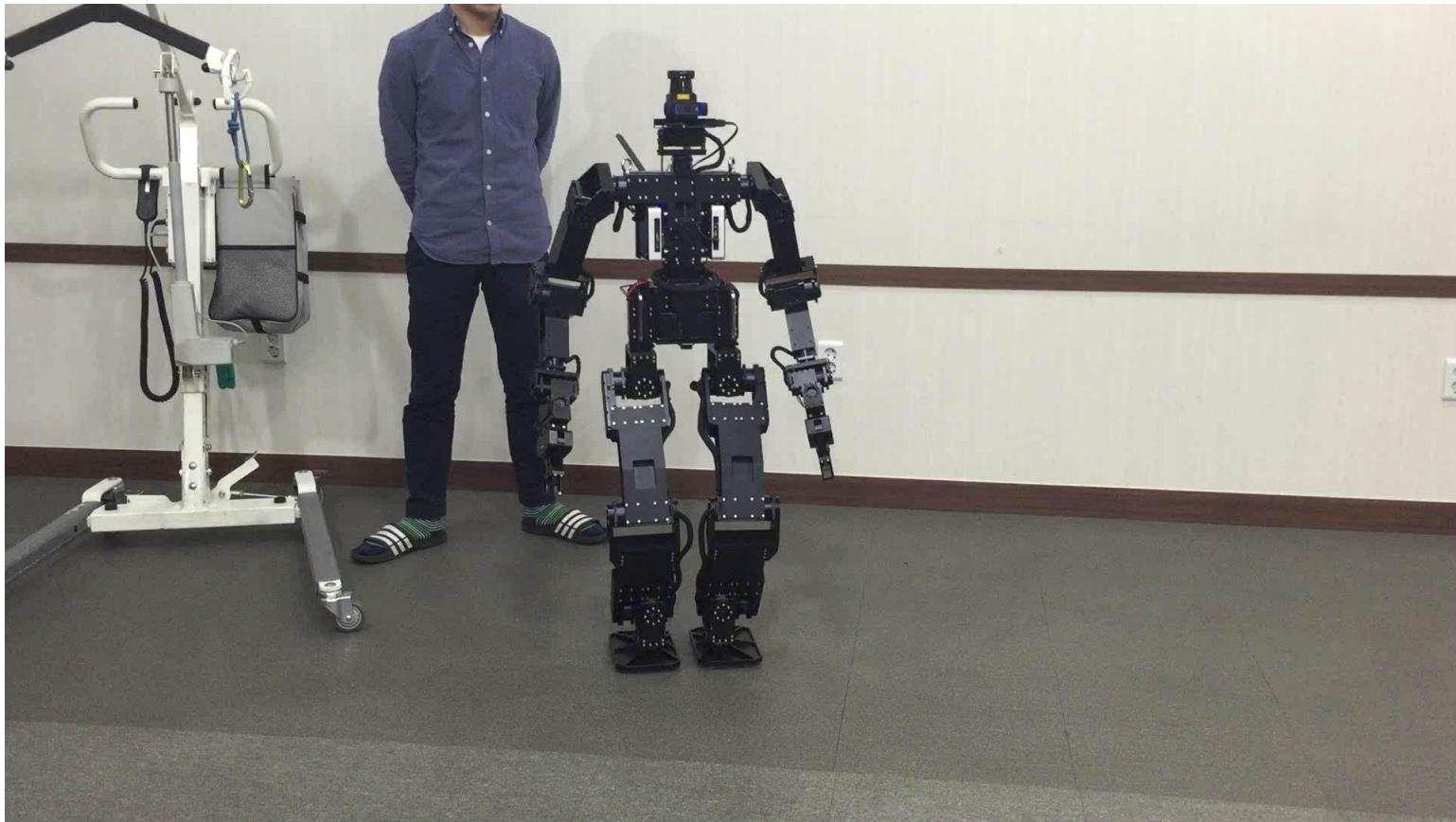




# Walking Demo



## 4. Walking Demo



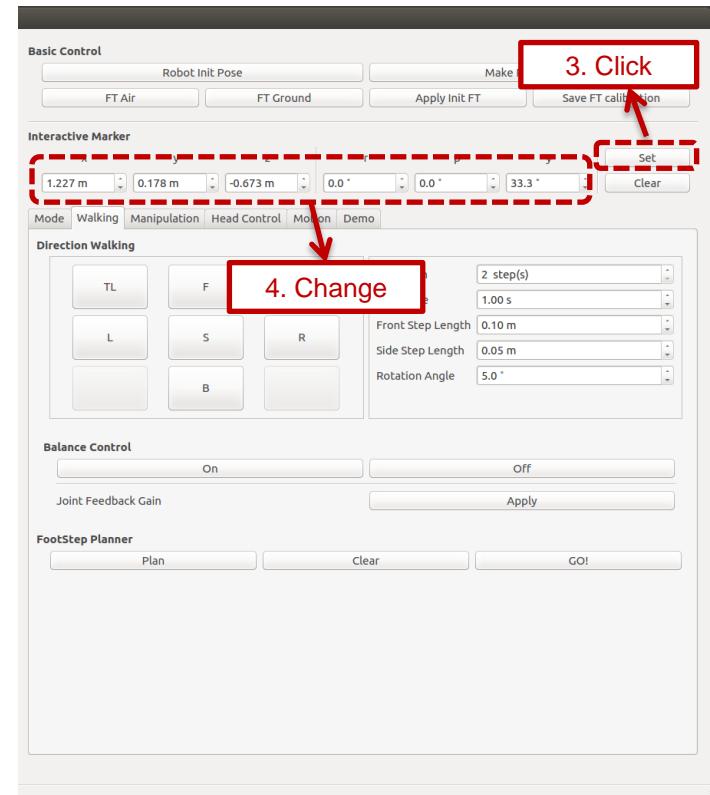
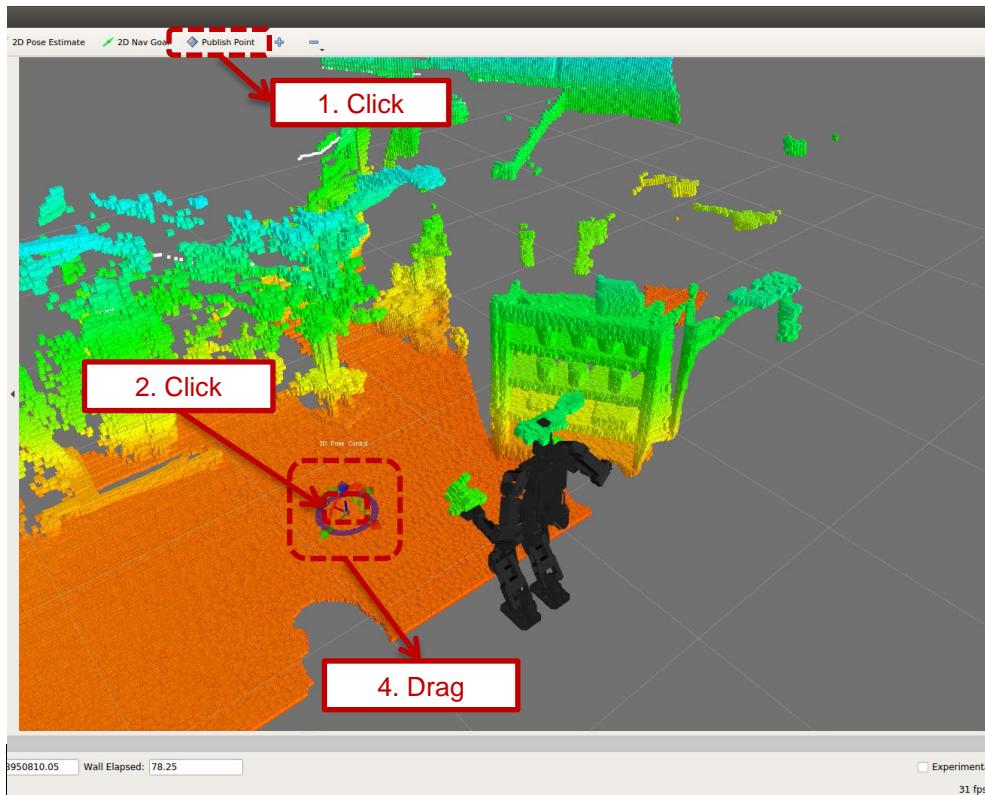


# Walking Demo



## 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



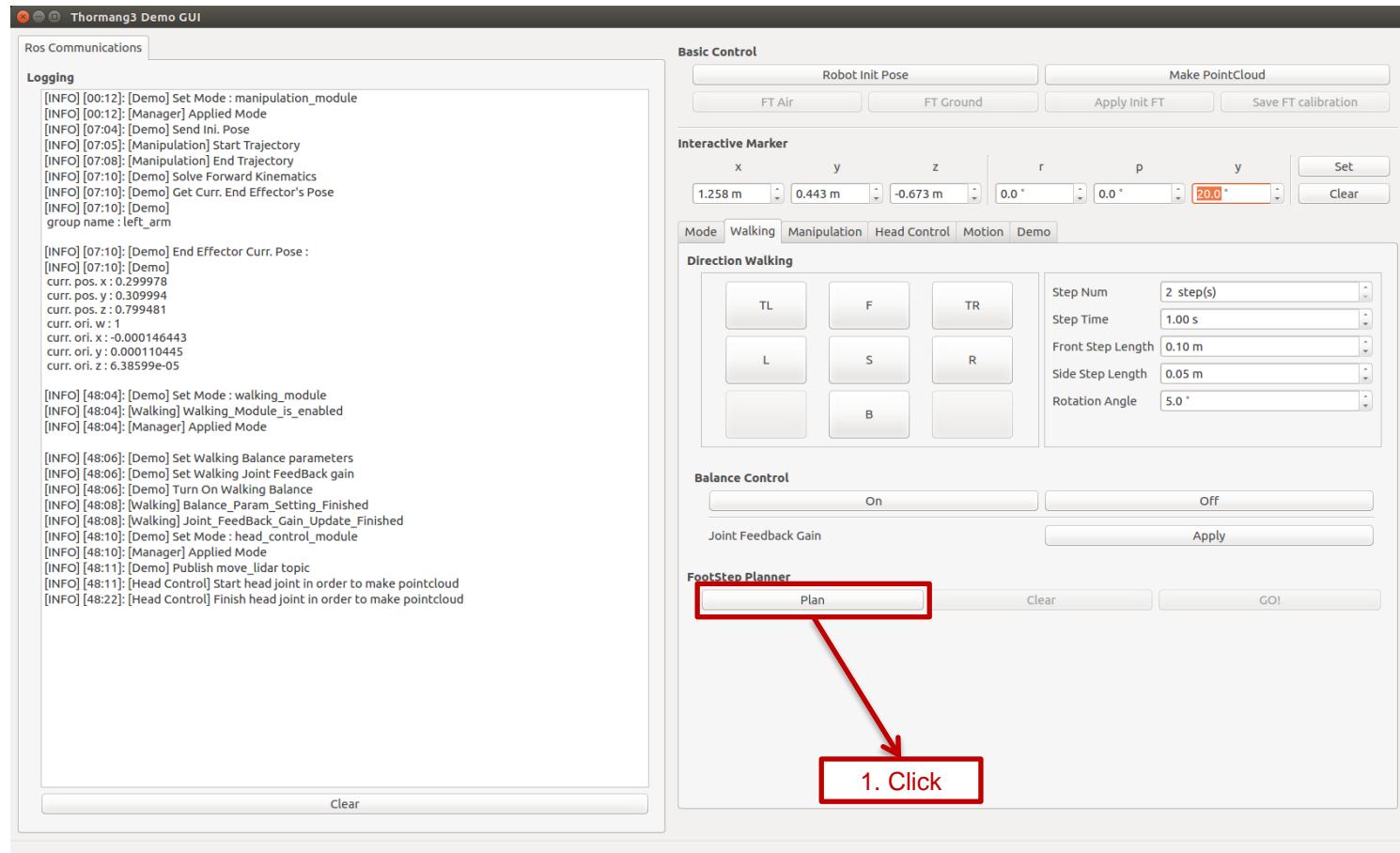


# Walking Demo



## 4. Walking Demo

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



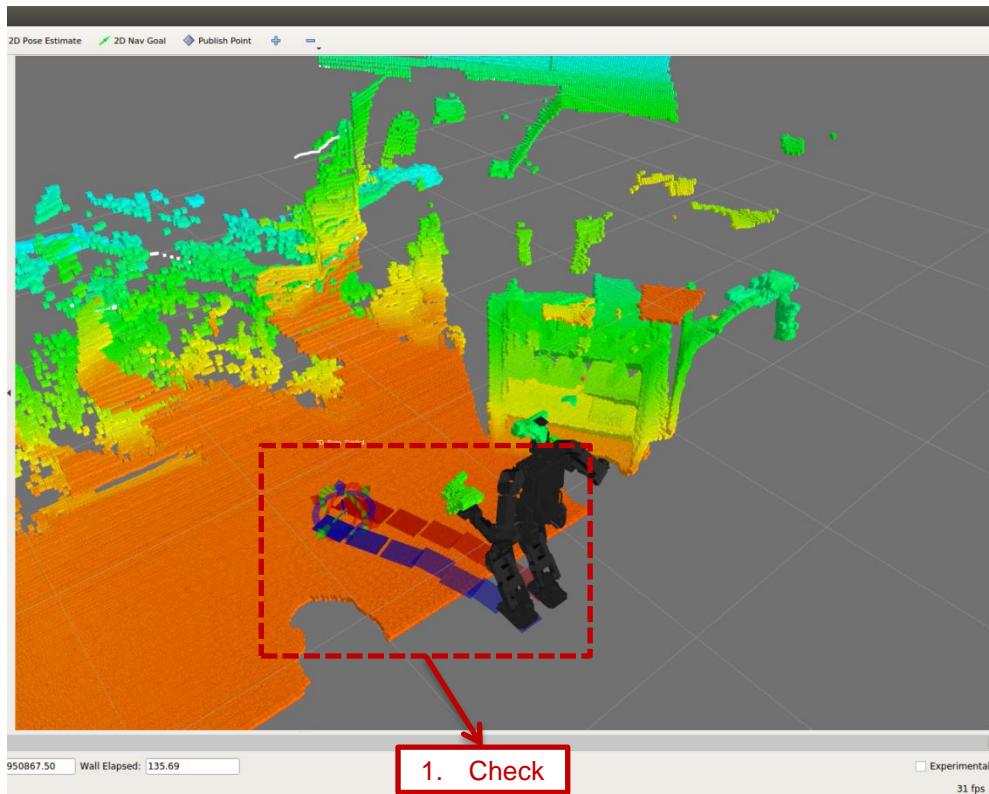


# Walking Demo



## 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