Brief introduction and use of rviz

rviz is a 3D visualization platform in ROS. On one hand, it can realize the graphical display of external information, and on the other hand, it can also release control information to an object through rviz, realizing the monitoring and control of a robot.

1 Installation of rviz and the introduction to its interface

When installing ros, if you perform a complete installation, rviz is already installed, and you may try to run it directly; if it is not fully installed, you may install rviz separately:

```
# Ubuntu16.04
sudo apt-get install ros-kinetic-rviz
# Ubuntu18.04
sudo apt-get install ros-melodic-rviz
# Ubuntu20.04
sudo apt-get install ros-noetic-rviz
```

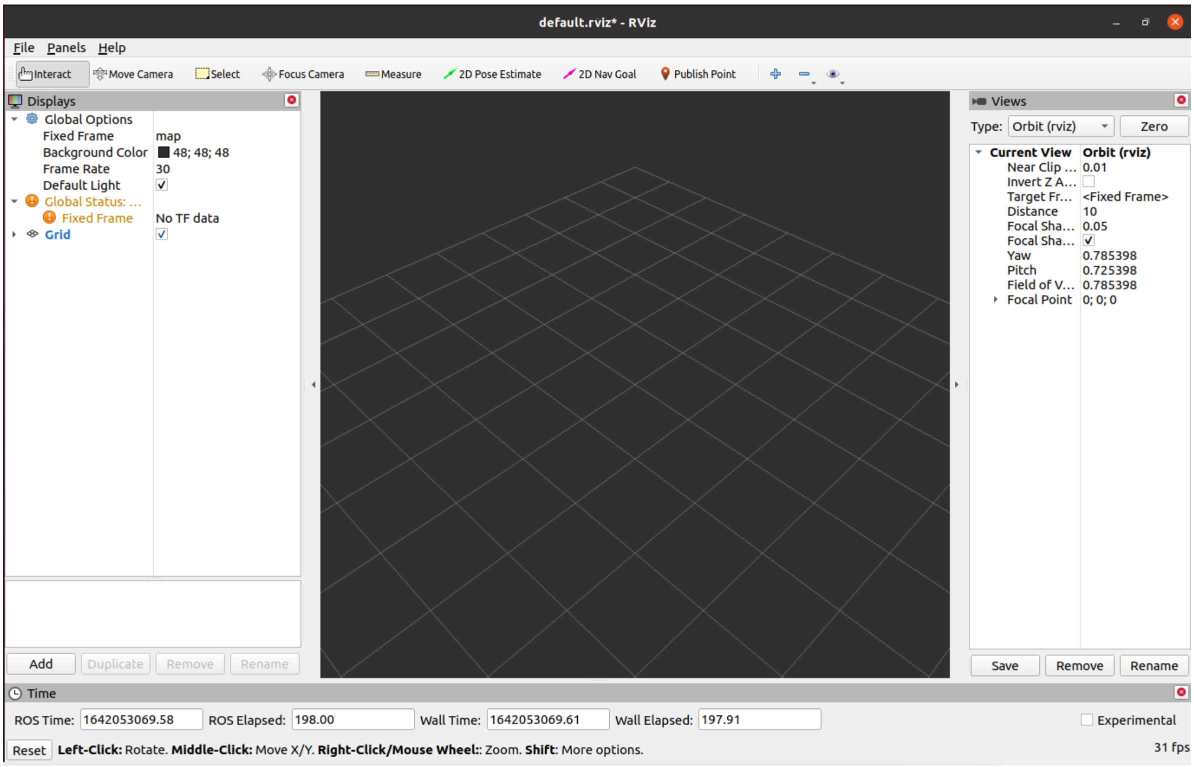
After the installation is complete, open a new terminal (shortcut key: Ctrl+Alt+T) and enter the following command:

```
roscore
```

Then open a new terminal (shortcut key: Ctrl+Alt+T) and input the following command to open rviz.

```
rosrun rviz rviz
# or
rviz
```

Open rviz, and the following interface will be displayed:



Displays

Global Options	
Fixed Frame	map
Background Color	■ 48; 48; 48
Frame Rate	30
Default Light	☑
Global Status: ...	
Fixed Frame	No TF data
Grid	☑

Views

Type: Orbit (rviz)

Current View	Orbit (rviz)
Near Clip ...	0.01
Invert Z A...	□
Target Fr...	<Fixed Frame>
Distance	10
Focal Sha...	0.05
Focal Sha...	☑
Yaw	0.785398
Pitch	0.725398
Field of V...	0.785398
Focal Point	0; 0; 0

Time

ROS Time: 1642053069.58 ROS Elapsed: 198.00 Wall Time: 1642053069.61 Wall Elapsed: 197.91 □ Experimental

Left-Click: Rotate. **Middle-Click:** Move X/Y. **Right-Click/Mouse Wheel:**: Zoom. **Shift:** More options. 31 fps

1.1 Introduction of all areas

- There is a list of monitors on the left. The monitor is a device that draws something in a 3D world and may have some options available in the display list.
- On the top is a toolbar, which allows the user to use various function buttons to select tools with multiple functions.
- The middle part is the 3D view: It is a main screen where various data can be viewed in three dimensions. The background color, fixed frame, grid, etc. of the 3D view can be set in detail in the Global Options and Grid items displayed on the left.
- Below is the time display area, including system time and ROS time.
- The right side is the observation angle setting area where different observation angles can be set.

We only give a rough introduction in this part. If you want to know more details, go to User Guide.

2 mycobot_ros installation and update

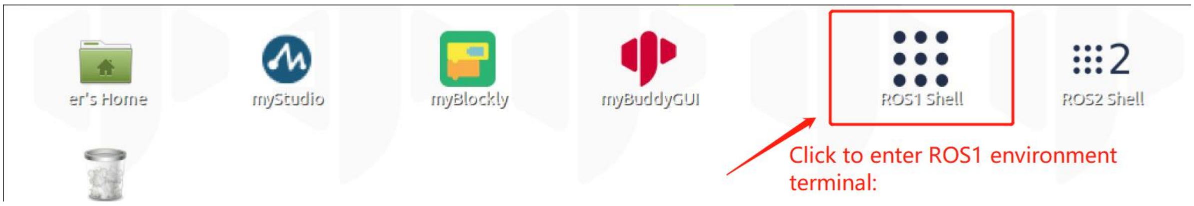
- **M5 Version:** Please refer to the end of the [13.1.1 Environment Building] chapter.
- **PI版本(Ubuntu 20.04):**

`mycobot_ros` is a ROS package from ElephantRobotics that works with all types of desktop robots.

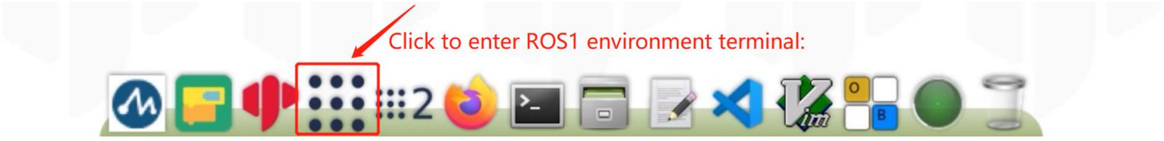
The address of the project: https://github.com/elephantrobotics/mycobot_ros

The official default ROS1 workspace is `catkin_ws`.

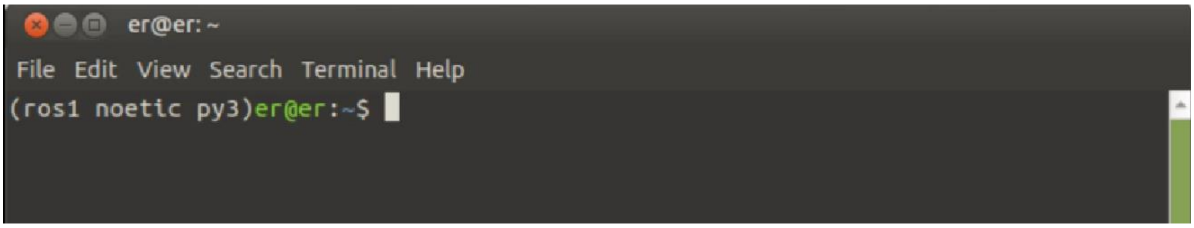
Click the `ROS1 Shell` icon on the desktop or the corresponding icon in the lower bar of the desktop to open the ROS1 environment terminal:



Click to enter ROS1 environment terminal:



Click to enter ROS1 environment terminal:



```
(ros1 noetic py3)er@er:~$ 
```

Then enter the following command:

```
cd ~/catkin_ws/src  # Enter the src folder of the workspace
# Clone the code on github
git clone https://github.com/elephantrobotics/mycobot_ros.git
cd ..       # return to the workspace
catkin_make # Build the code in the workspace
source devel/setup.bash # add environment variables
```

Note: If the `/home/er/catkin_ws/src(equivalent to ~/catkin_ws/src)` already exists in the `mycobot_ros` folder, you need to delete the `mycobot_ros` folder before running the above command. In the directory path, `er` is the user name of the VM. If they are different, change them.

3 Simple use

Start using launch file

This example is built on what you have already done Environment building and you have successfully copied the company's code from GitHub to your virtual machine.

Open a new terminal (shortcut key: Ctrl+Alt+T)

Input the command to **configure the ROS environment**.

```
cd ~/catkin_ws/
source devel/setup.bash
```

Input again:

- mycobot 280-M5 version:

```
roslaunch mycobot_280 test.launch
```

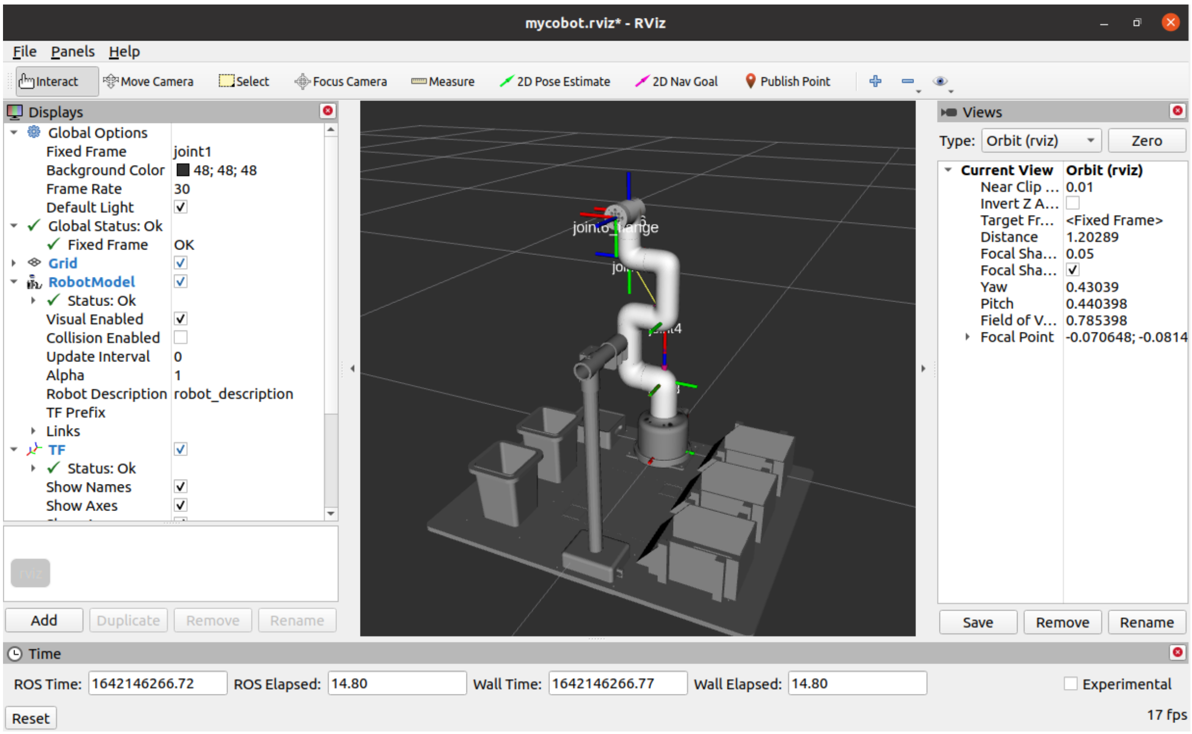
- mycobot 280-Pi version:

```
roslaunch mycobot_280pi test.launch
```

- mycobot 280-JetsonNano version:

```
roslaunch mycobot_280jn test.launch
```

Open rviz, and then you will obtain the following result:



Global Options
Fixed Frame joint1
Background Color 48; 48; 48
Frame Rate 30
Default Light ☑
Global Status: Ok
Fixed Frame OK
Grid ☑
RobotModel ☑
Status: Ok
Visual Enabled ☑
Collision Enabled □
Update Interval 0
Alpha 1
Robot Description robot_description
TF Prefix
Links
TF ☑
Status: Ok
Show Names ☑
Show Axes ☑

Type: Orbit (rviz)
Current View Orbit (rviz)
Near Clip ... 0.01
Invert Z A... □
Target Fr... <Fixed Frame>
Distance 1.20289
Focal Sha... 0.05
Focal Sha... ☑
Yaw 0.43039
Pitch 0.440398
Field of V... 0.785398
Focal Point -0.070648; -0.0814

ROS Time: 1642146266.72 ROS Elapsed: 14.80 Wall Time: 1642146266.77 Wall Elapsed: 14.80 □ Experimental

17 fps

If you want to know more information about rviz, go to Official documents.

4 M5 Version Prerequisites

- Type Ctrl+Shift+T in the command terminal to open another terminal window in the same directory to view the device name:

```
# View the device name of the robotic arm
ls /dev/ttyUSB* # old version myCobot280 M5

# If the terminal does not display the /dev/ttyUSB related name, you need to use the following command
ls /dev/ttyACM* # new version myCobot280 M5
```

- Grant the serial port permission to the robotic arm:

```
# The default device name is /dev/ttyUSB0, if the device name is not the default value, it needs to be modified.
sudo chmod 777 /dev/ttyUSB0 # old version myCobot280 M5

sudo chmod 777 /dev/ttyACM0 # new version myCobot280 M5
```

Then enter the user password(**Note:** The password is not displayed, just enter it correctly).

Control and following of the robot arm

1 Slider Control

Open a command line and run:

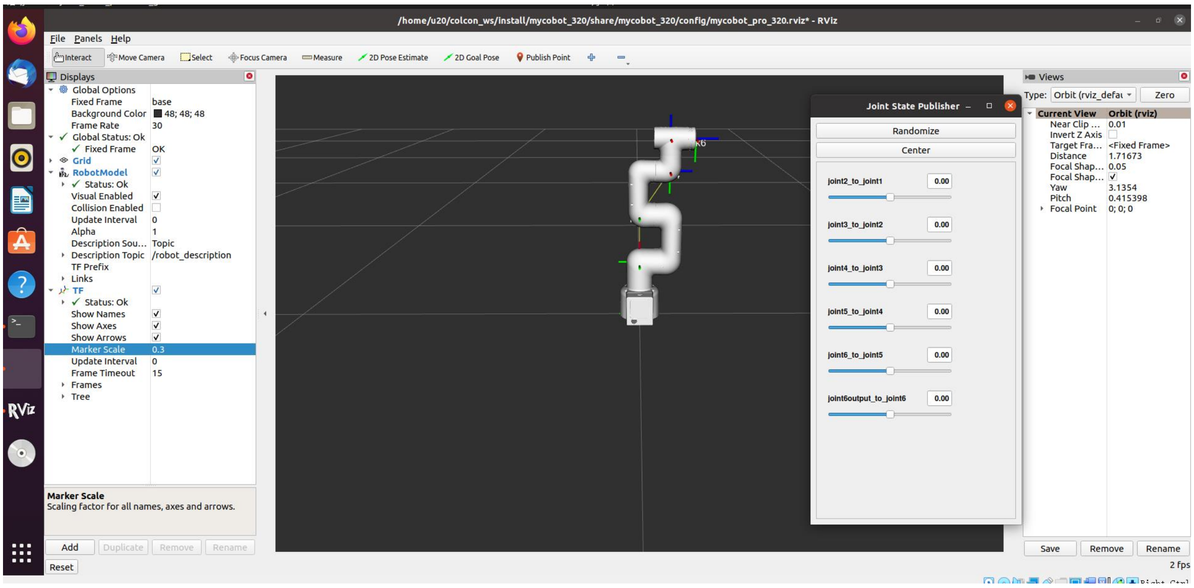
- 2022 mycobot 320-M5 version：

```
# The default serial port name of 2022 mycobot 320-M5 version is "/dev/ttyUSB0",
and the baud rate is 115200. The serial port name of some models is
"dev/ttyACM0". If the default serial port name is wrong, you can change the
serial port name to "/dev/ttyACM0".
roslaunch new_mycobot_320 mycobot_320_slider.launch port:=/dev/ttyUSB0
baud:=115200
```

- 2022 mycobot 320-Pi version：

```
# The default serial port name of 2022 mycobot 320-Pi version is "/dev/ttyAMA0",
and the baud rate is 115200.
roslaunch new_mycobot_320_pi mycobot_320_slider.launch port:=/dev/ttyAMA0
baud:=115200
```

rviz and a slider component will be opened, and you will see the following interface:



/home/u20/colcon_ws/install/mycobot_320/share/mycobot_320/config/mycobot_pro_320.rviz* - RViz

Displays

- Global Options
  - Fixed Frame: base
  - Background Color: 48; 48; 48
  - Frame Rate: 30
- ✓ Global Status: Ok
  - ✓ Fixed Frame: OK
- Grid: ☑
- RobotModel: ☑
  - ✓ Status: Ok
  - Visual Enabled: ☑
  - Collision Enabled: □
  - Update Interval: 0
  - Alpha: 1
  - Description Sou...: Topic
  - Description Topic: /robot_description
  - TF Prefix
  - Links
- TF: ☑
  - ✓ Status: Ok
  - Show Names: ☑
  - Show Axes: ☑
  - Show Arrows: ☑
  - Marker Scale: 0.3
  - Update Interval: 0
  - Frame Timeout: 15
  - Frames
  - Tree

Marker Scale
Scaling factor for all names, axes and arrows.

Joint State Publisher

- joint2_to_joint1: 0.00
- joint3_to_joint2: 0.00
- joint4_to_joint3: 0.00
- joint5_to_joint4: 0.00
- joint6_to_joint5: 0.00
- joint6output_to_joint6: 0.00

Views

Type: Orbit (rviz_defau

- Current View: Orbit (rviz)
  - Near Clip ...: 0.01
  - Invert Z Axis: □
  - Target Fra...: <Fixed Frame>
  - Distance: 1.71673
  - Focal Shap...: 0.05
  - Focal Shap...: ☑
  - Yaw: 3.1354
  - Pitch: 0.415398
  - Focal Point: 0; 0; 0

Then you can **control the model in rviz to make it move by dragging the slider**. If you want the real mycobot to move with the model, you need to open another command line and run:

- 2022 mycobot 320-M5 version：

```
# The default serial port name of 2022 mycobot 320-M5 version is "/dev/ttyUSB0",
and the baud rate is 115200. The serial port name of some models is
"dev/ttyACM0". If the default serial port name is wrong, you can change the
serial port name to "/dev/ttyACM0".
rosrun new_mycobot_320 mycobot_320_slider.py _port:=/dev/ttyUSB0 _baud:=115200
```

- 2022 mycobot 320-Pi version：

```
# The default serial port name of 2022 mycobot 320-Pi version is "/dev/ttyAMA0",
and the baud rate is 115200.
rosrun new_mycobot_320_pi mycobot_320_slider.py _port:=/dev/ttyAMA0
_baud:=115200
```

Note: Since the robot arm will move to the current position of the model when the command is input, make sure that the model in rviz does not appear to be worn out before you use the command.

Do not drag the slider quickly after connecting the robot arm to prevent damage to the robot arm.

2 Model Following

In addition to the above controls, we can also let the model move by following the real robot arm. Open a command line and run:

- 2022 mycobot 320-M5 version:

```
# The default serial port name of 2022 mycobot 320-M5 version is "/dev/ttyUSB0", and the baud rate is 115200. The serial port name of some models is "dev/ttyACM0". If the default serial port name is wrong, you can change the serial port name to "/dev/ttyACM0".
rosrun new_mycobot_320 mycobot_320_follow_display.py _port:=/dev/ttyUSB0 _baud:=115200
```

- 2022 mycobot 320-pi version:

```
# The default serial port name of 2022 mycobot 320-Pi version is "/dev/ttyAMA0", and the baud rate is 115200.
rosrun new_mycobot_320_pi mycobot_320_follow_display.py _port:=/dev/ttyAMA0 _baud:=115200
```

Then open another command line and run:

- 2022 mycobot 320-M5 version:

```
roslaunch new_mycobot_320 mycobot_320_follow_display.launch
```

- 2022 mycobot 320-Pi version:

```
roslaunch new_mycobot_320_pi mycobot_320_follow_display.launch
```

It will **open rviz to show the model following effect.**

3 GUI control

On the basis of the previous contents, this package also **provides a simple GUI control interface.** This method is used for interaction between real robot arms. Connect to mycobot.

Open a command line:

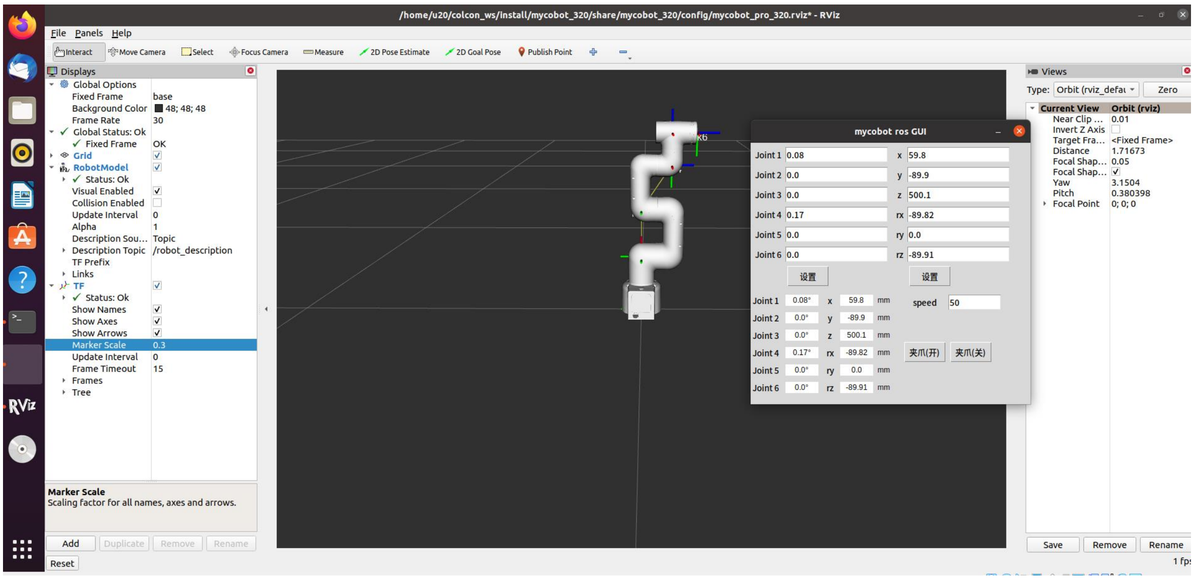
- 2022 mycobot 320-M5 version:

```
# The default serial port name of 2022 mycobot 320-M5 version is "/dev/ttyUSB0", and the baud rate is 115200. The serial port name of some models is "dev/ttyACM0". If the default serial port name is wrong, you can change the serial port name to "/dev/ttyACM0".
roslaunch new_mycobot_320 mycobot_320_simple_gui.launch port:=/dev/ttyUSB0 baud:=115200
```

- 2022 mycobot 320-Pi version:

```
# The default serial port name of 2022 mycobot 320-Pi version is "/dev/ttyAMA0", and the baud rate is 115200.
roslaunch new_mycobot_320_pi mycobot_320_simple_gui.launch port:=/dev/ttyAMA0 baud:=115200
```

Running effect:



/home/u20/colcon_ws/install/mycobot_320/share/mycobot_320/config/mycobot_pro_320.rviz* - RViz

Displays
- Global Options
  - Fixed Frame: base
  - Background Color: ■ 48; 48; 48
  - Frame Rate: 30
- ✓ Global Status: Ok
  - ✓ Fixed Frame: OK
- Grid ☑
- RobotModel ☑
  - ✓ Status: Ok
  - Visual Enabled ☑
  - Collision Enabled □
  - Update Interval: 0
  - Alpha: 1
  - Description Sou...: Topic
  - Description Topic: /robot_description
  - TF Prefix
  - Links
- TF ☑
  - ✓ Status: Ok
  - Show Names ☑
  - Show Axes ☑
  - Show Arrows ☑
  - Marker Scale: 0.3
  - Update Interval: 0
  - Frame Timeout: 15
  - Frames
  - Tree

Marker Scale
Scaling factor for all names, axes and arrows.

mycobot ros GUI

Joint 1	0.08	x	59.8
Joint 2	0.0	y	-89.9
Joint 3	0.0	z	500.1
Joint 4	0.17	rx	-89.82
Joint 5	0.0	ry	0.0
Joint 6	0.0	rz	-89.91

Joint 1	0.08°	x	59.8	mm
Joint 2	0.0°	y	-89.9	mm
Joint 3	0.0°	z	500.1	mm
Joint 4	0.17°	rx	-89.82	mm
Joint 5	0.0°	ry	0.0	mm
Joint 6	0.0°	rz	-89.91	mm

speed: 50

Views
Type: Orbit (rviz_defau

Current View	Orbit (rviz)
Near Clip ...	0.01
Invert Z Axis	□
Target Fra...	<Fixed Frame>
Distance	1.71673
Focal Shap...	0.05
Focal Shap...	☑
Yaw	3.1504
Pitch	0.380398
Focal Point	0; 0; 0

4 Keyboard control

Keyboard control is added in `new_mycobot_320` package, and real-time Synchronization is performed in rviz. This function depends on pythonApi, so be sure to connect with the real robot arm.

Open a command line and run:

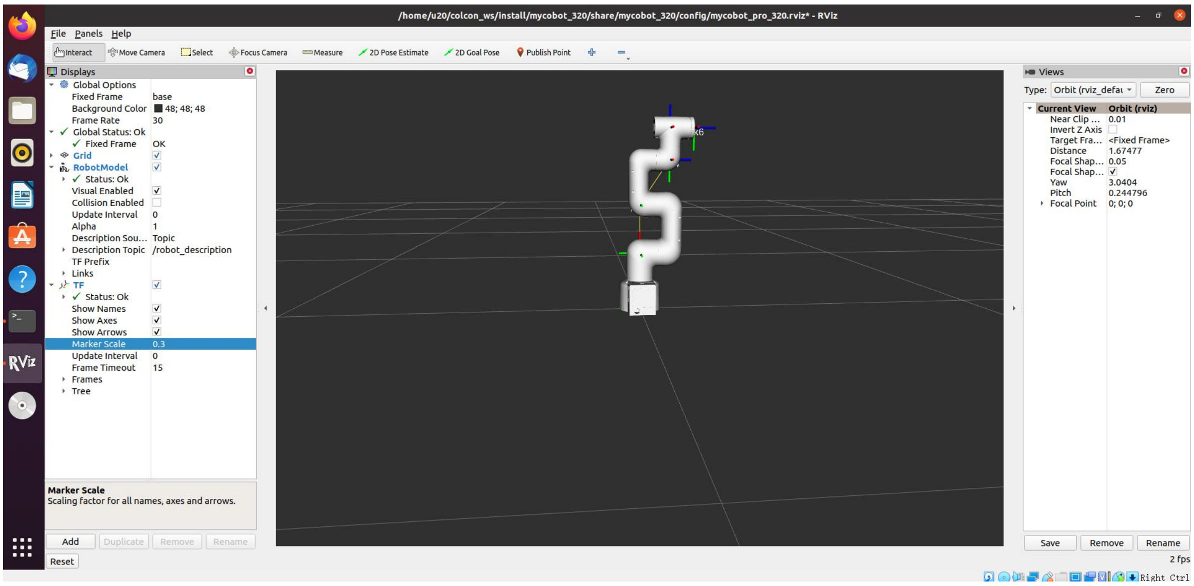
- 2022 mycobot 320-M5 version:

```
# The default serial port name of 2022 mycobot 320-M5 version is "/dev/ttyUSB0", and the baud rate is 115200. The serial port name of some models is "dev/ttyACM0". If the default serial port name is wrong, you can change the serial port name to "/dev/ttyACM0".
roslaunch new_mycobot_320 mycobot_320_teleop_keyboard.launch port:=/dev/ttyUSB0 baud:=115200
```

- 2022 mycobot 320-Pi version:

```
# The default serial port name of mycobot 320-Pi version is "/dev/ttyAMA0", and
the baud rate is 115200.
roslaunch new_mycobot_320_pi mycobot_320_teleop_keyboard.launch
port:=/dev/ttyAMA0 baud:=115200
```

Running effect is as follows:



Displays	
Global Options	
Fixed Frame	base
Background Color	48; 48; 48
Frame Rate	30
✓ Global Status: Ok	
✓ Fixed Frame	OK
Grid	☑
RobotModel	☑
✓ Status: Ok	
Visual Enabled	☑
Collision Enabled	□
Update Interval	0
Alpha	1
Description Sou…	Topic
Description Topic	/robot_description
TF Prefix	
Links	
TF	☑
✓ Status: Ok	
Show Names	☑
Show Axes	☑
Show Arrows	☑
Marker Scale	0.3
Update Interval	0
Frame Timeout	15
Frames	
Tree	

Marker Scale
Scaling factor for all names, axes and arrows.

Current View	Orbit (rviz)
Near Clip …	0.01
Invert Z Axis	□
Target Fra…	<Fixed Frame>
Distance	1.67477
Focal Shap…	0.05
Focal Shap…	☑
Yaw	3.0404
Pitch	0.244796
Focal Point	0; 0; 0

mycobot information will be output in the command line as follows:

```
SUMMARY
========

PARAMETERS
 * /mycobot_services/baud: 115200
 * /mycobot_services/port: /dev/ttyUSB0 or /dev/ttyAMA0
 * /robot_description: <?xml version="1....
 * /rosdistro: kinetic
 * /rosversion: 1.12.17

NODES
  /
    mycobot_services (mycobot_320/mycobot_services.py)
    real_listener (mycobot_320/listen_real.py)
    robot_state_publisher (robot_state_publisher/state_publisher)
    rviz (rviz/rviz)

auto-starting new master
process[master]: started with pid [1333]
ROS_MASTER_URI=http://localhost:11311

setting /run_id to f977b3f4-b3a9-11eb-b0c8-d0c63728b379
process[rosout-1]: started with pid [1349]
started core service [/rosout]
process[robot_state_publisher-2]: started with pid [1357]
process[rviz-3]: started with pid [1367]
process[mycobot_services-4]: started with pid [1380]
process[real_listener-5]: started with pid [1395]
[INFO] [1620882819.196217]: start ...
[INFO] [1620882819.205050]: /dev/ttyAMA0,115200
```

```
MyCobot Status
--------------------------------
Joint Limit:
    joint 1: -165 ~ +165
    joint 2: -165 ~ +165
    joint 3: -165 ~ +165
    joint 4: -165 ~ +165
    joint 5: -165 ~ +165
    joint 6: -175 ~ +175

Connect Status: True

Servo Infomation: all connected

Servo Temperature: unknown

Atom Version: unknown

[INFO] [1620882819.435778]: ready
```

Then open another command line and run:

- 2022 mycobot 320-M5 verion:

```
rosrun new_mycobot_320 mycobot_320_teleop_keyboard.py
#or
rosrun new_mycobot_320 mycobot_320_teleop_keyboard.py _speed:=70
```

- 2022 mycobot 320-Pi version:

```
rosrun new_mycobot_320_pi mycobot_320_teleop_keyboard.py
#or
rosrun new_mycobot_320_pi mycobot_320_teleop_keyboard.py _speed:=70
```

You will see the following output in the command line:

```
Mycobot Teleop Keyboard Controller
---------------------------
Movimg options(control coordinations [x,y,z,rx,ry,rz]):
              w(x+)

    a(y-)     s(x-)     d(y+)

    z(z-) x(z+)

u(rx+)   i(ry+)   o(rz+)
j(rx-)   k(ry-)   l(rz-)

Gripper control:
    g - open
    h - close

Other:
    1 - Go to init pose
    2 - Go to home pose
    3 - Resave home pose
    q - Quit

currently:      speed: 50       change percent 5
```

In this terminal, you can control the state of the robot arm and move it using the keys in the command line.

Parameters supported by this script:

- _speed: the movement speed of the robot arm
- _change_percent: movement distance percentage