

2. MoveIt precautions and control of real machine

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MoveIt official website: http://docs.ros.org/en/melodic/api/moveit_tutorials/html/index.html

2.1. Preparation

According to different models, you only need to set the purchased model in [.bashrc], X1 (normal four-wheel drive) X3 (Mailun) Take X3 as an example

```
#Raspberry Pi 5 master needs to enter docker first, please perform this step
#If running the script into docker fails, please refer to ROS/07, Docker tutorial
~/run_docker.sh
```

Open the [.bashrc] file

```
sudo vim .bashrc
```

Find the [ROBOT_TYPE] parameters and modify the corresponding car model

```
export ROBOT_TYPE=X3plus # ROBOT_TYPE: X1 X3 X3plus R2 X7
```

This lesson is applicable to all MoveIT cases of robots; MoveIT is mainly aimed at robots with robotic arms.

2.2. Simulation startup

Just control the robot in the simulation under MoveIT simulation.

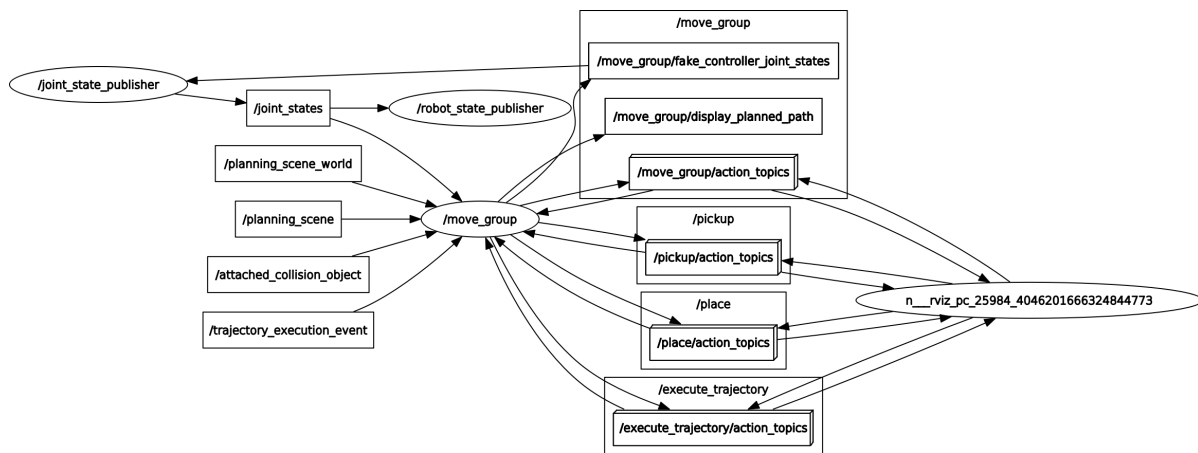
```
roslaunch arm_moveit_demo x3plus_moveit_demo.launch sim:=true # Recommended
virtual machine
```

Parameter use_rviz: whether to enable rviz, if true, enable it.

Parameter use_gui: Whether to enable the GUI control interface, if true, enable it. This parameter is only valid when sim is true.

```
rqt_graph
```

The node diagram is as follows:



2.3. Control the real machine

Controlling real machines is combined with MoveIT to control real robots.

- Hosted by a robot

```
roslaunch yahboomcar_bringup bringup.launch # Robot terminal
roslaunch arm_moveit_demo x3plus_moveit_demo.launch sim:=false # Recommended
virtual machine
```

- Host a virtual machine

```
roscore # virtual machine
roslaunch yahboomcar_bringup bringup.launch # Robot terminal
roslaunch arm_moveit_demo x3plus_moveit_demo.launch sim:=false # Recommended
virtual machine
```

The node diagram is as follows:



The corresponding relationship between the robotic arm servo and the joints: from the lowest end of the robotic arm to the end of the gripper.

Robotic arm servo	joint	joint
The first servo	joint1	joint1
Second servo	joint2	joint2

Robotic arm servo	joint	joint
The third servo	joint3	joint3
The fourth servo	joint4	joint4
The fifth servo	joint5	joint5
Servo that controls the gripper	grip_joint	Gripper

Handle control robotic arm

Button	Robotic arm	Button	Robotic arm
X	Joint 1 turns left (data decreases)	B	Joint 1 turns right (data increases)
A	Joint 2 goes down (data decreases)	Y	Joint 2 goes up (data increases)
Left click on the left row	Joint 3 down (data decreases)	Right click on the left row	Joint 3 up (data increased)
Left row down key	Joint 4 down (data decreases)	Left row up key	Joint 4 up (data increase)
L1 (default)	Joint 5 turns left (data increases)	L2 (default)	Joint 5 turns right (data increases)
L1	Clamping jaws tightened (data increased)	L2	Clamping jaws released (data reduced)

Handle [R2] key: Get the current joint angle of the robotic arm.

Use the [SELECT] key on the handle to switch between controlling [Joint 5] or controlling [Clamp].

At this time, use the handle to control the robotic arm, and you will find that the real machine and the MoveIT simulation run synchronously.

2.4. Notes

Note: Problems that may arise are not inevitable.

2.4.1. Start the robotic arm

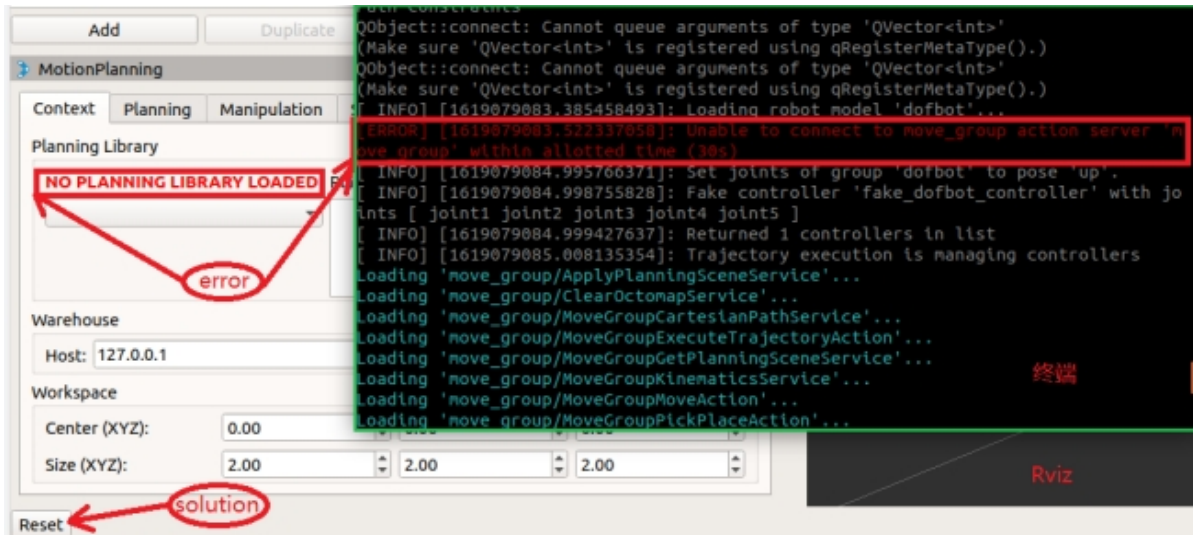
Regardless of whether you are using MoveIT or not, when you start the controller to control the real robot, the status of the controller is connected, but the robot cannot be controlled.

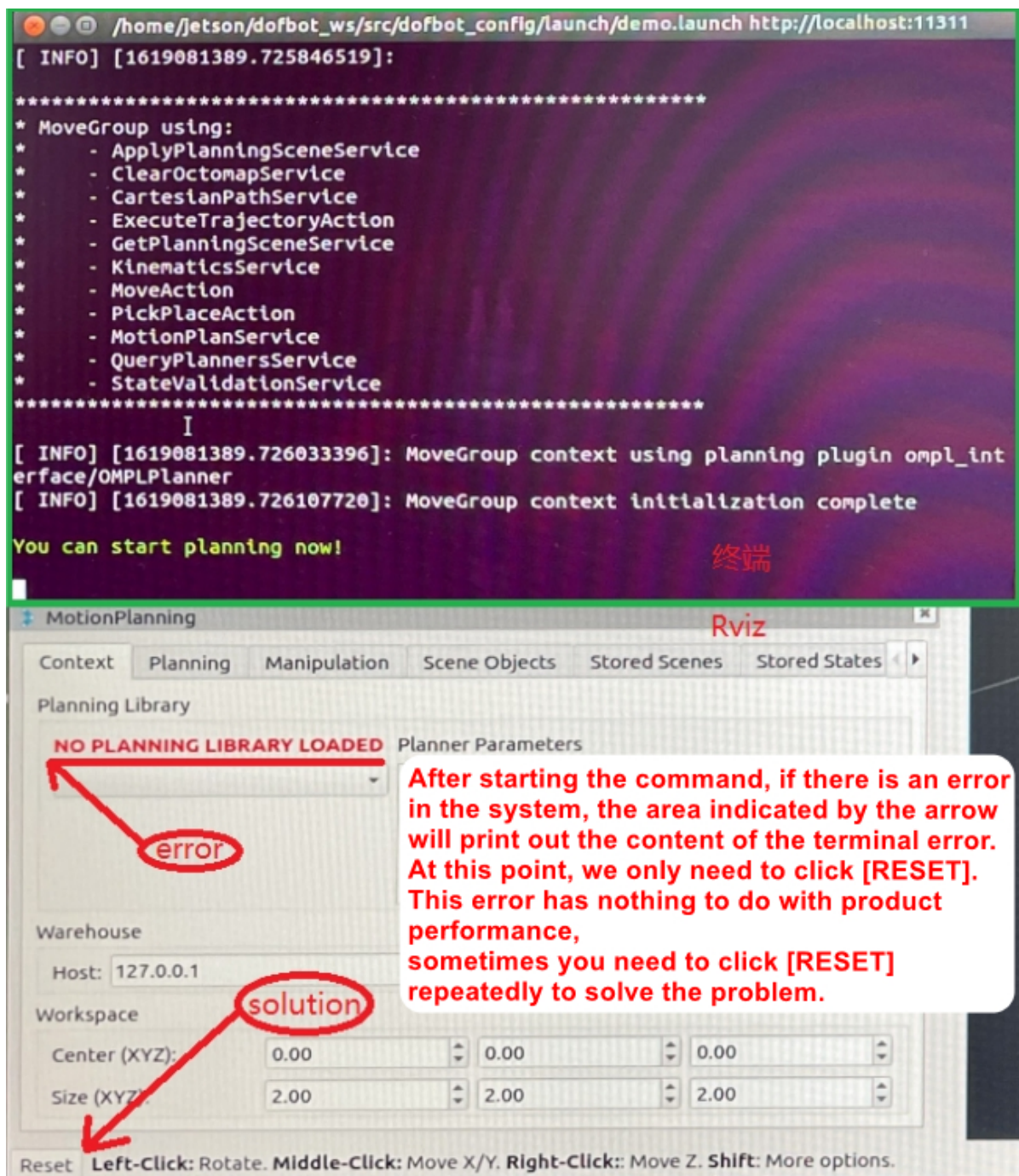
In this case, the handle control node may be obtaining the current position of the robotic arm, and the current position data of the robotic arm is [-1] (out of range or failed to read).

Solution: Click the [START] button on the handle multiple times, and at the same time, grab the gripper and gently rock the robot arm up and down until you hear the buzzer sound.

2.4.2. MoveIt startup

The MoveIt simulation environment starts slowly, so wait patiently and observe the terminal. An error occurs as shown in the figure below. The solution is as shown in the figure. If the terminal reports an error and the motion planning library is not loaded, click [Reset] in the lower left corner and reload. At first, it is during the loading process. Don't rush to click [Reset]. If you click it before loading is complete, the system will reload and it will not start.





As shown in the figure below, if [Replanning: yes] appears on the terminal and a green [OMPL] appears below the Planning Library, the startup is successful.

```
[ INFO] [1619079085.126261894]: MoveGroup context using planning plugin ompl_interface/OMPLPlanner
[ INFO] [1619079085.126296501]: MoveGroup context initialization complete

You can start planning now!

[ INFO] [1619079144.018331969]: Stopping planning scene monitor
[ WARN] [1619079144.058627471]: SEVERE WARNING!!! Attempting to unload library while objects created by this loader exist in the heap! You should delete your objects before attempting to unload the library or destroying the ClassLoader. The library will NOT be unloaded.
[ INFO] [1619079144.060378130]: Loading robot model 'dofbot'...
[ INFO] [1619079153.366458947]: Starting planning scene monitor
[ INFO] [1619079153.368822804]: Listening to '/move_group/monitored_planning_scene'
[ INFO] [1619079156.233051823]: Constructing new MoveGroup connection for group 'dofbot' in namespace ''
[ INFO] [1619079157.321685434]: Ready to take commands for planning group dofbot.
[ INFO] [1619079157.321798709]: Looking around: yes
[ INFO] [1619079157.321866431]: Replanning: yes
```

