

机械臂代码调试

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参考：SDK中的Jaka_ROS中的ROS包和相关文件、JAKA Zu Minicab V1.1 用户手册-中文版。

1 机械臂调试说明

机械臂搭配的工控机并不能直接在其上面开发，需要通过其他PC和机械臂的工控机连接进行**TCP通信**，连接有两种方式：通过**网线硬件连接**和**直接连接工控机的WIFI**；另一方面，机械臂的工控机有两个网口可以使用：LAN1和LAN2；

- LAN1：LAN1口是固定IP：10.5.5.100，如果使用WIFI连接机械臂的热点，就是连接LAN1口。
- LAN2：LAN2口通过APP上位机手动固定IP。

Note：TCP通信要求**连接**之后，PC和机械臂的工控机网口的IP在同一网段。

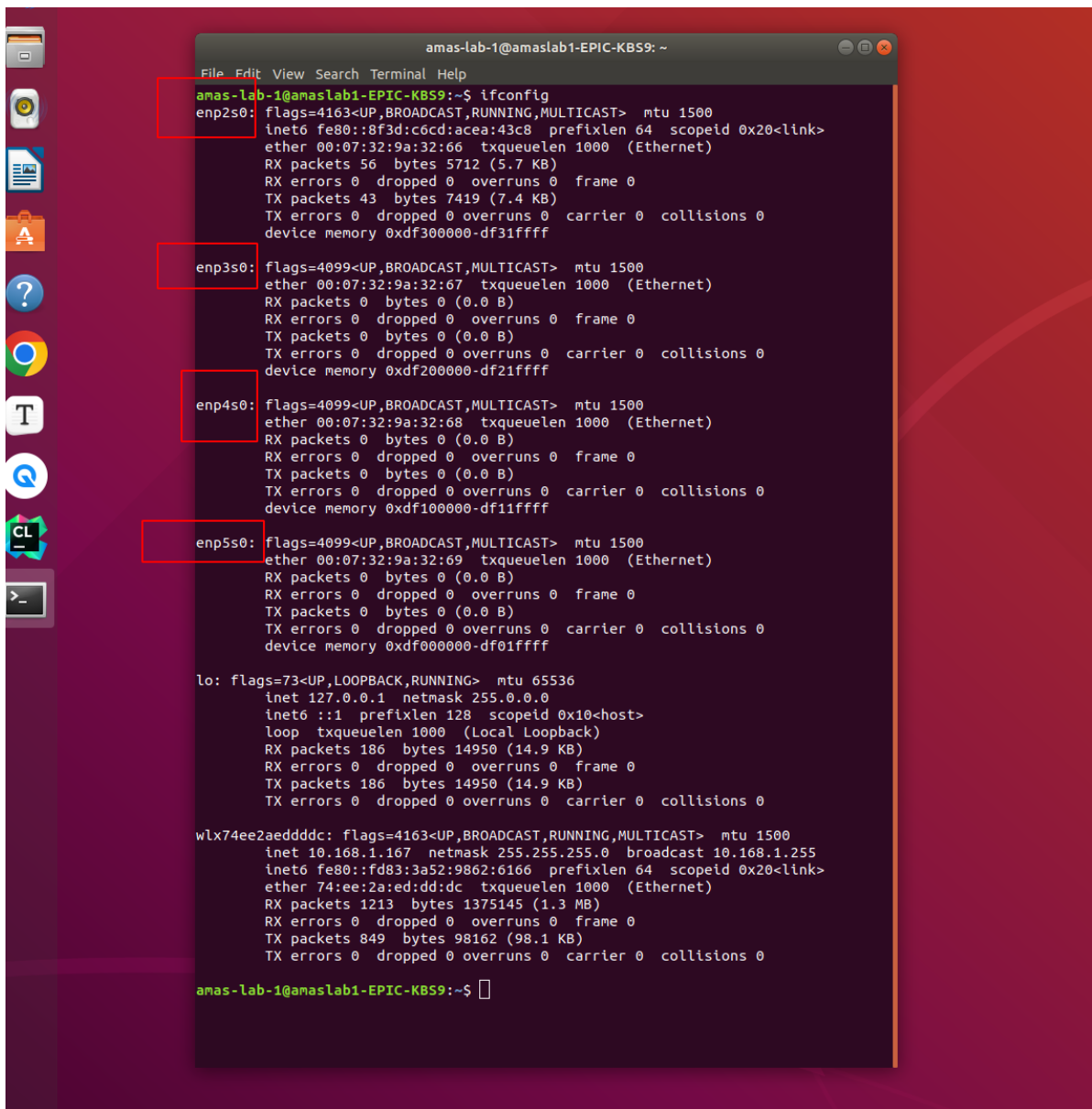
2 网口配置

(1) 上位机修改机械臂工控机LAN2口IP

The screenshot shows the 'Network Settings' (网络设置) screen in the JAKA mobile app. The 'Use the following IP address' (使用下面的IP地址) option is selected. The IP address is set to 192.168.200.100, the subnet mask is 255.255.255.0, and the default gateway is 192.168.200.1. A 'Confirm' (确定) button is at the bottom.

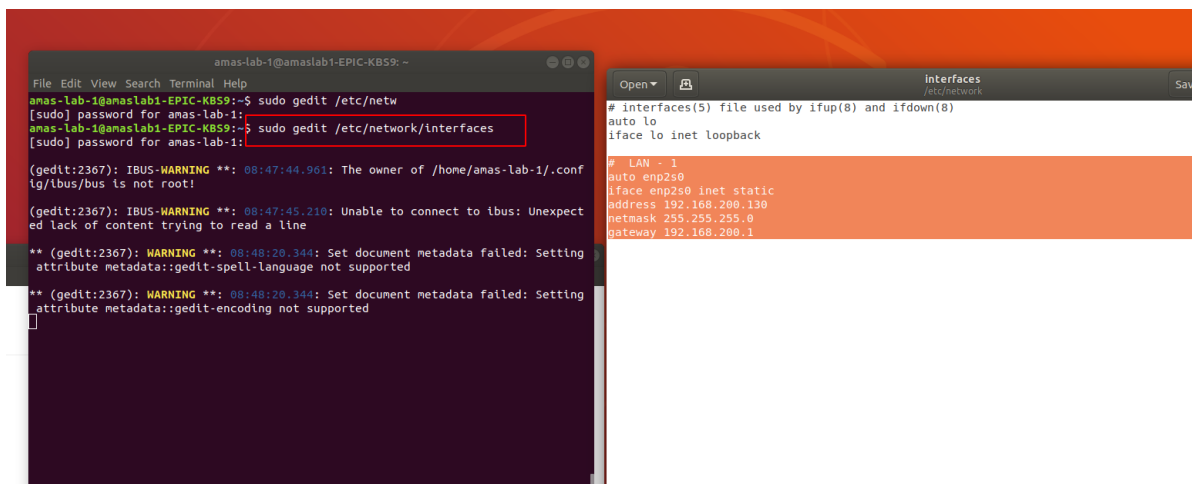
如上图所示，修改IP为：192.168.200.100 。

(2) PC修改IP，实现和机械臂工控机在同一网段



```
amas-lab-1@amaslab1-EPIC-KBS9: ~  
File Edit View Search Terminal Help  
amas-lab-1@amaslab1-EPIC-KBS9:~$ ifconfig  
enp2s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
        inet6 fe80::8f3d:c6cd:acea:43c8 prefixlen 64 scopeid 0x20<link>  
        ether 00:07:32:9a:32:66 txqueuelen 1000 (Ethernet)  
        RX packets 56 bytes 5712 (5.7 KB)  
        RX errors 0 dropped 0 overruns 0 frame 0  
        TX packets 43 bytes 7419 (7.4 KB)  
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
        device memory 0xdf300000-df31ffff  
  
enp3s0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500  
        ether 00:07:32:9a:32:67 txqueuelen 1000 (Ethernet)  
        RX packets 0 bytes 0 (0.0 B)  
        RX errors 0 dropped 0 overruns 0 frame 0  
        TX packets 0 bytes 0 (0.0 B)  
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
        device memory 0xdf200000-df21ffff  
  
enp4s0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500  
        ether 00:07:32:9a:32:68 txqueuelen 1000 (Ethernet)  
        RX packets 0 bytes 0 (0.0 B)  
        RX errors 0 dropped 0 overruns 0 frame 0  
        TX packets 0 bytes 0 (0.0 B)  
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
        device memory 0xdf100000-df11ffff  
  
enp5s0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500  
        ether 00:07:32:9a:32:69 txqueuelen 1000 (Ethernet)  
        RX packets 0 bytes 0 (0.0 B)  
        RX errors 0 dropped 0 overruns 0 frame 0  
        TX packets 0 bytes 0 (0.0 B)  
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
        device memory 0xdf000000-df01ffff  
  
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536  
        inet 127.0.0.1 netmask 255.0.0.0  
        inet6 ::1 prefixlen 128 scopeid 0x10<host>  
        loop txqueuelen 1000 (Local Loopback)  
        RX packets 186 bytes 14950 (14.9 KB)  
        RX errors 0 dropped 0 overruns 0 frame 0  
        TX packets 186 bytes 14950 (14.9 KB)  
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
wl74ee2aeddddc: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
        inet 10.168.1.167 netmask 255.255.255.0 broadcast 10.168.1.255  
        inet6 fe80::fd83:3a52:9862:6166 prefixlen 64 scopeid 0x20<link>  
        ether 74:ee:2a:ed:dd:dc txqueuelen 1000 (Ethernet)  
        RX packets 1213 bytes 1375145 (1.3 MB)  
        RX errors 0 dropped 0 overruns 0 frame 0  
        TX packets 849 bytes 98162 (98.1 KB)  
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
amas-lab-1@amaslab1-EPIC-KBS9:~$
```

这里用的实验室的工控机，使用 `ifconfig` 查看网口，可以看到总共有四个网口，这里我们使用第一个网口：`enp2s0`。

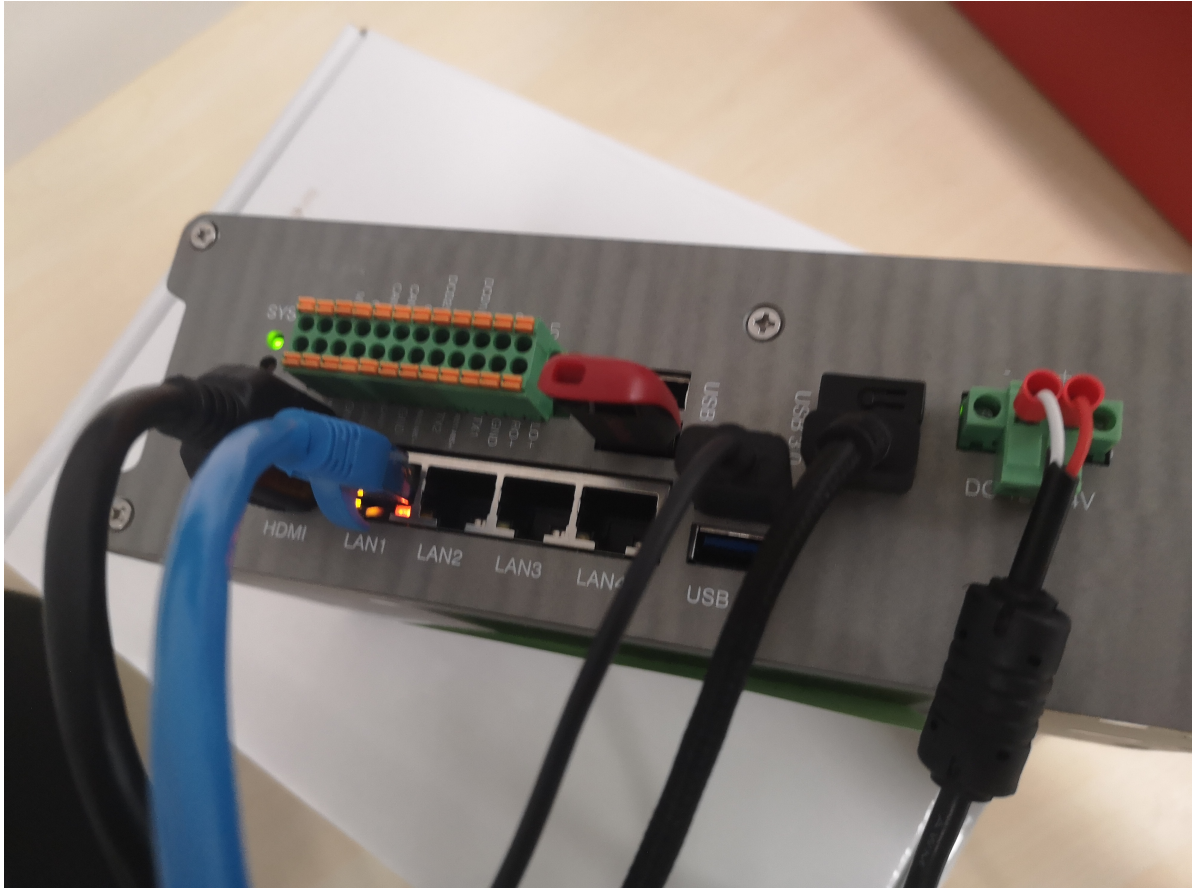


```
amas-lab-1@amaslab1-EPIC-KBS9: ~  
File Edit View Search Terminal Help  
amas-lab-1@amaslab1-EPIC-KBS9:~$ sudo gedit /etc/netw  
[sudo] password for amas-lab-1:  
amas-lab-1@amaslab1-EPIC-KBS9:~$ sudo gedit /etc/network/interfaces  
[sudo] password for amas-lab-1:  
  
(gedit:2367): IBUS-WARNING **: 08:47:44.961: The owner of /home/amas-lab-1/.conf  
ig/ibus/bus is not root!  
  
(gedit:2367): IBUS-WARNING **: 08:47:45.210: Unable to connect to ibus: Unexpect  
ed lack of content trying to read a line  
  
** (gedit:2367): WARNING **: 08:48:20.344: Set document metadata failed: Setting  
attribute metadata:gedit-spell-language not supported  
  
** (gedit:2367): WARNING **: 08:48:20.344: Set document metadata failed: Setting  
attribute metadata:gedit-encoding not supported  
  
# interfaces(5) file used by ifup(8) and ifdown(8)  
auto lo  
iface lo inet loopback  
  
# LAN - 1  
auto enp2s0  
iface enp2s0 inet static  
address 192.168.200.130  
netmask 255.255.255.0  
gateway 192.168.200.1
```

修改IP: `sudo gedit /etc/network/interfaces` , 添加:

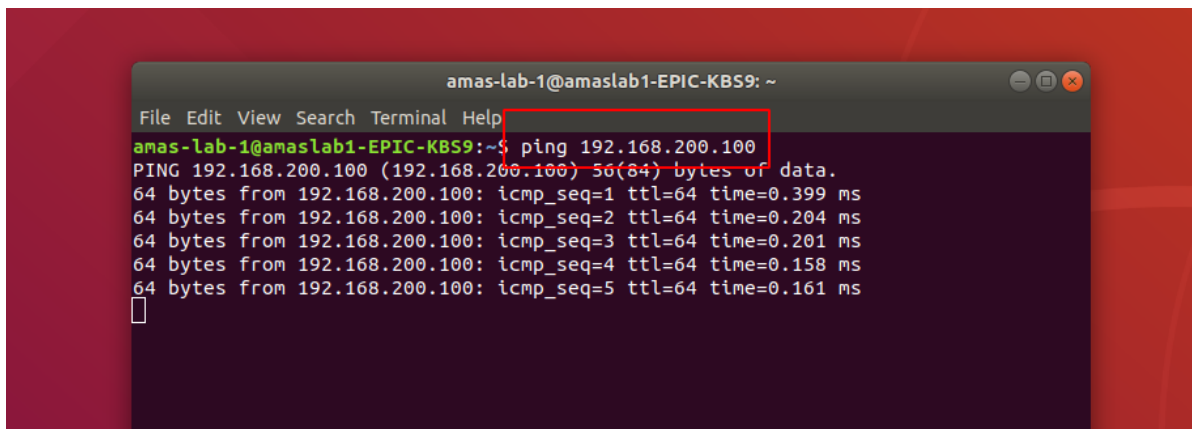
```
auto enp2s0
iface enp2s0 inet static
address 192.168.200.130
netmask 255.255.255.0
gateway 192.168.200.1
```

即，将工控机PC的LAN1网口修改为：192.168.200.130，修改完只有 `reboot` 重启生效



连接实验室的工控机PC和机械臂的工控机（上图用的是工控机PC的LAN1）：

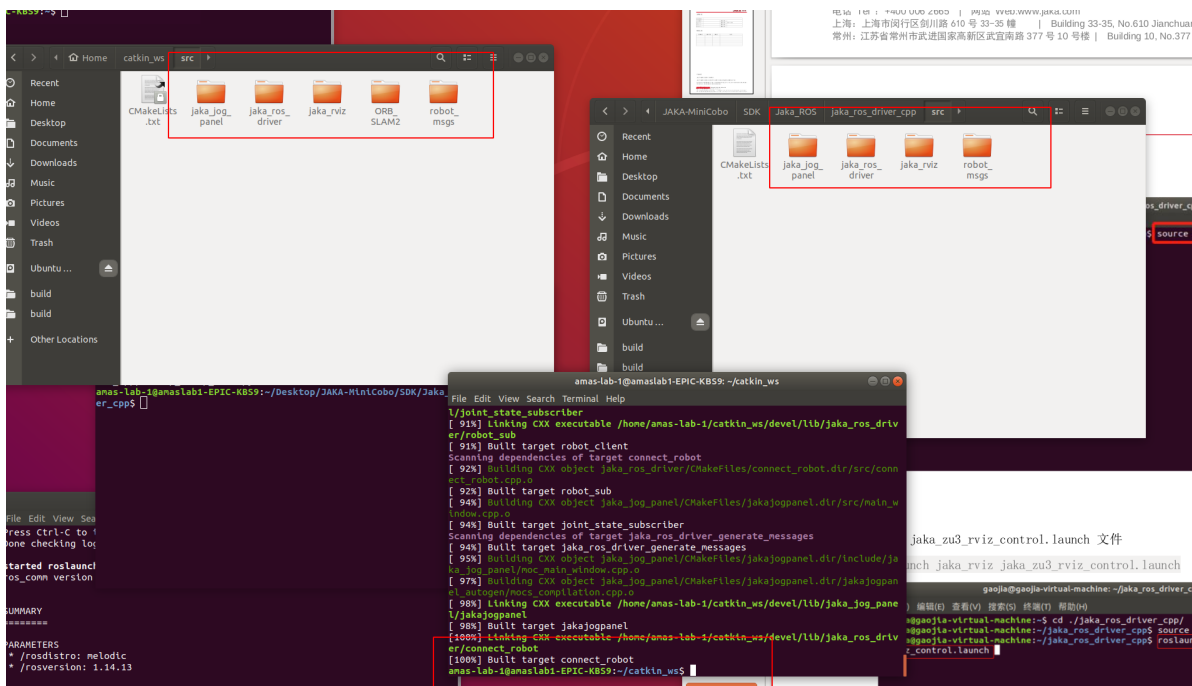
(3) 通信测试



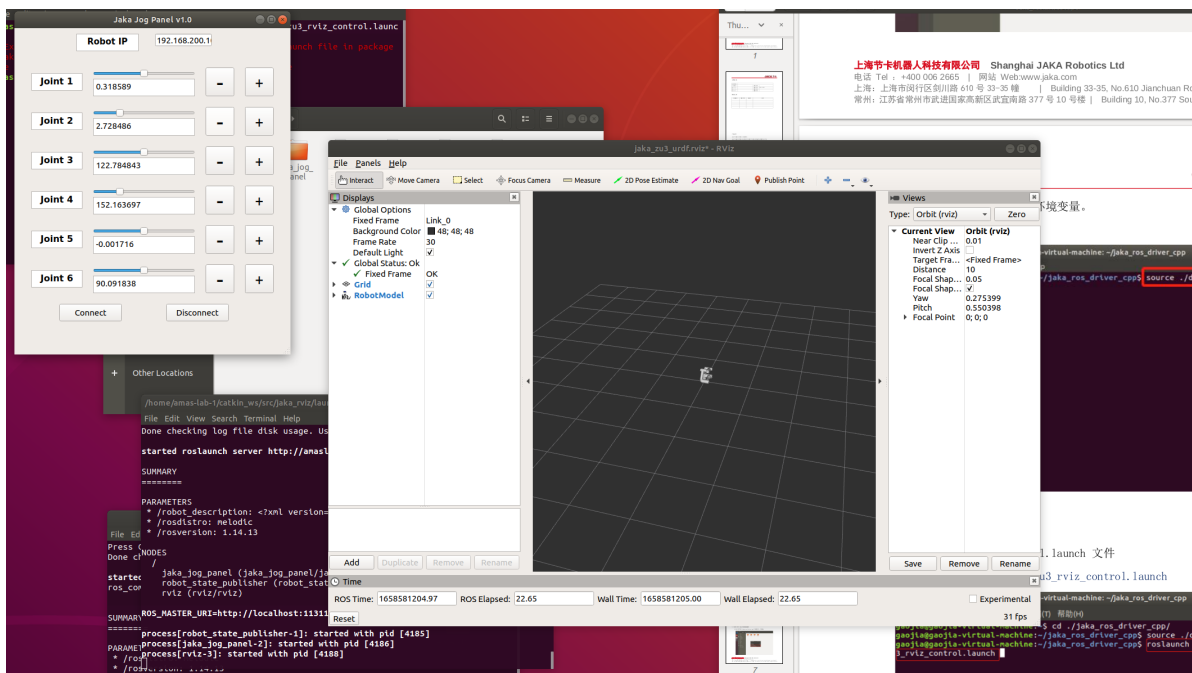
用实验室工控机测试：`ping 192.168.200.100` 如上图所示不断返还信息则说明通信搭建成功。

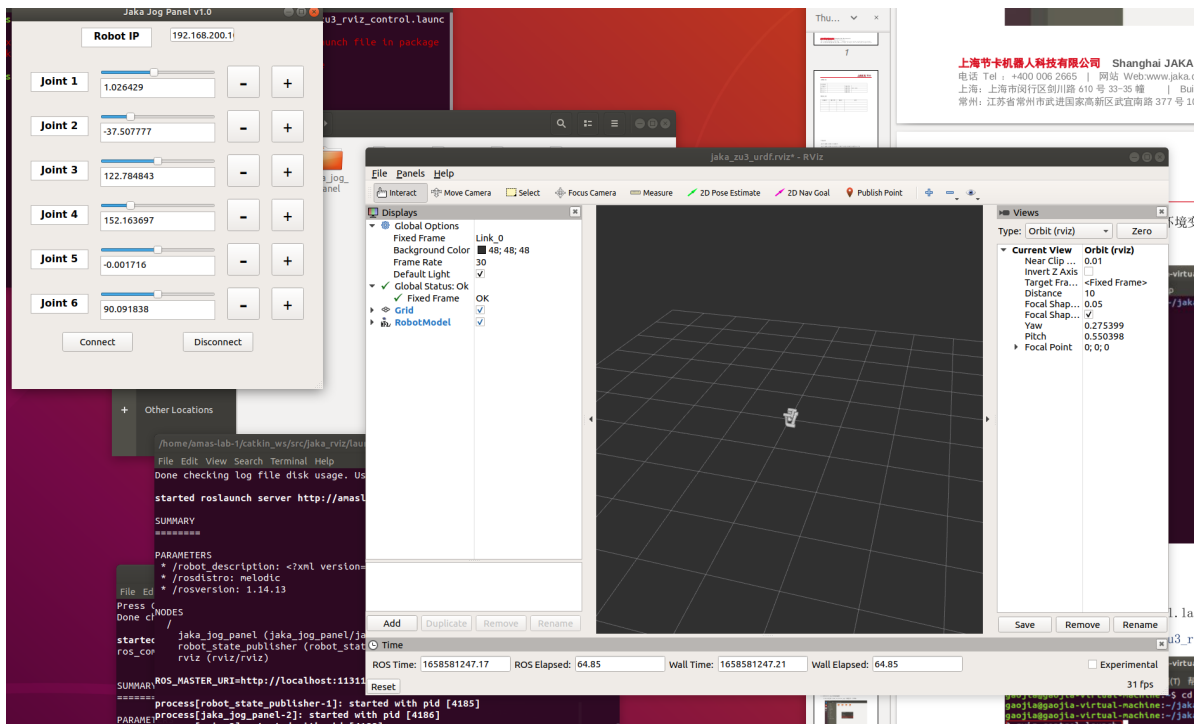
3 ROS实现

该部分主要参考：[Jaka_ros使用说明](#) 文件。



这里有点和 **Jaka_ros使用说明** 文件不同的是，正确的做法如上图所示：将 `jaka_ros_driver_cpp/src` 下的四个功能包文件复制到电脑本身的ROS workspace中，然后 `catkin_make`编译之后就可以运行。





运行效果如上所示。