

2、 Camera internal reference calibration

Before driving a depth camera, it is necessary for the host to be able to recognize the Astra camera device; When entering the Docker container, you need to mount this Astra device to recognize the camera in the Docker container. The supporting host has already been built in an environment and does not require additional configuration. If it is on a new host, a rule file needs to be added. The addition method is very simple. Copy the "/etc/udev rules. d/56 orbbec-usb rules" file from the host computer to the "/etc/udev rules. d" directory in the new environment, and then restart system.

1、 Preparation before calibration

- A large chessboard of known size. This tutorial uses a 9x6 checkerboard and a 20mm square, which needs to be flattened during calibration.**The calibration uses the internal vertices of the chessboard grid, so the "10x7" chessboard uses the internal vertex parameter "9x6", as shown in the following example.** Any specification of calibration board is fine, just change the parameters. An open area with no obstacles or calibration board patterns
- Monocamera for publishing images through ROS.

2、 Start calibration

Install the calibrated feature pack camera_Calibration, Docker terminal input,

```
sudo apt install ros-foxy-camera-calibration*
```

Start the camera before calibration, and then turn off the camera until all calibration is completed. Start the camera (taking starting the astraproplus camera as an example), input in the Docker terminal,

```
ros2 launch astra_camera astro_pro_plus.launch.xml
```

Starting reference for other Astra camera models,

Launch file	Camera model
ros2 launch astra_camera astra_pro.launch.xml	Astrapro
ros2 launch astra_camera astro_pro_plus.launch.xml	Astraproplus
ros2 launch astra_camera astra.launch.xml	Astramini

Use the following command to view the topic, enter in the Docker terminal,

```
ros2 topic list
```

```
jetson@jetson-desktop:~$ sudo docker exec -it 606d27b5158b /bin/bash
-----
my_robot_type: x3 | my_lidar: a1 | my_camera: astrapro
-----
root@jetson-desktop:/# ros2 topic list
/camera/color/camera_info
/camera/color/image_raw
/camera/depth/camera_info
/camera/depth/image_raw
/camera/depth/points
/camera/ir/camera_info
/camera/ir/image_raw
/parameter_events
/rosout
/tf
/tf_static
root@jetson-desktop:/#
```

The topic we need to use to calibrate RGB color images is "/camera/color/imageraw".

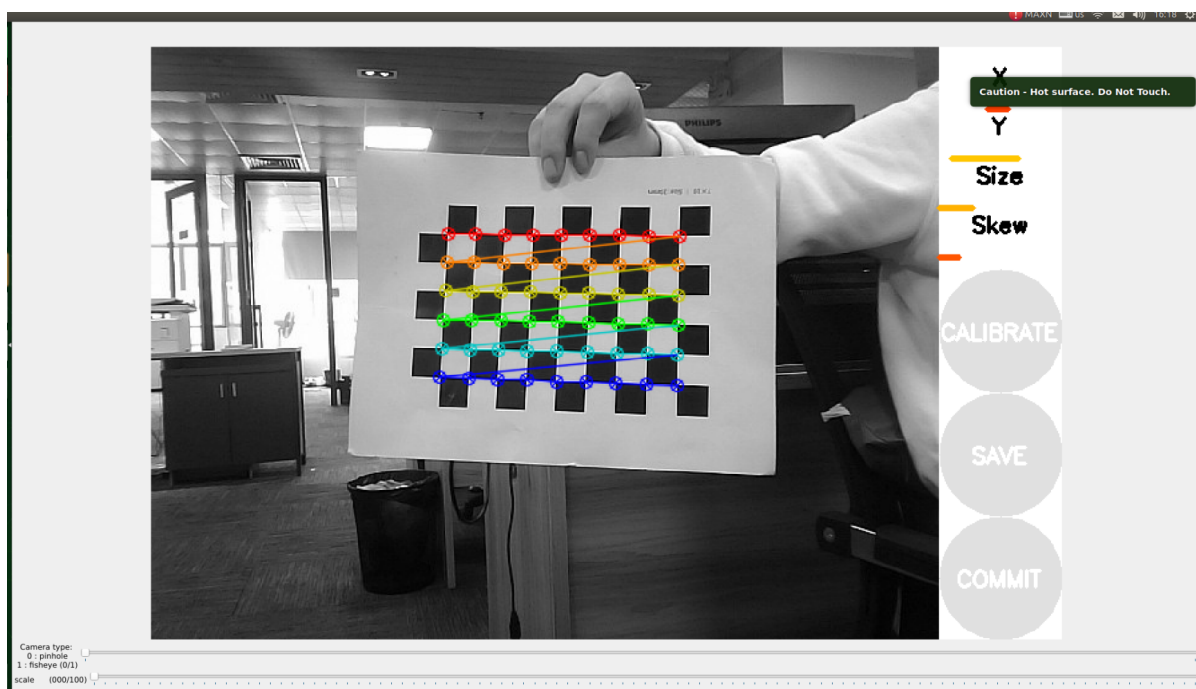
Run the calibration program and input it into the Docker terminal,

```
ros2 run camera_calibration cameracalibrator --size 9x6 --square 0.02 --ros-args
--remap /image:=/camera/color/image_raw
```

size: Calibrate the number of internal corner points on the chessboard, such as 9X6, with a total of six rows and nine columns of corner points.

square: Calibrate the number of internal corner points on the chessboard, such as 9X6, with a total of six rows and nine columns of corner points. The side length of a chessboard grid, measured in meters.

Topic Name: /camera/color/image_raw, If you are running the [usb_cam] file, Need to modify here to [/imageraw]



X: The left and right movement of the checkerboard in the camera's field of view

Y: Move the checkerboard up and down in the camera's field of view

Size : The forward and backward movement of the checkerboard in the camera's field of view

Skew: The tilting and rotation of the checkerboard in the camera's field of view

As shown in the above figure, it is necessary to capture the image by flipping it up, down, back, left, right, and left to make the X, Y, Size, and Skew on the right turn green, as shown in the following figure. Then, click CALIBRATE to start calibration.



After calibration, click SAVE, as shown in the following figure,



Save the calibration results to **[/tmp/calibration data. tar. gz]**, and the saved path is in the terminal directory where the calibration program was started. After calibration, you can move out the file **[/tmp/calibrationdata. tar. gz]** to see the content

```
sudo mv /tmp/calibrationdata.tar.gz ~
```

Docker terminal input,

```
cd ~  
tar -xvf calibrationdata.tar.gz
```

The calibrated png file, ost.yaml, and ost.txt files will be obtained in the terminal directory.

Due to the fact that the Astra driver starts with built-in parameters calibrated in the code, there is no need to load the calibrated parameters. However, when starting a USB camera, the parameters need to be loaded. Therefore, after calibration, the parameters need to be replaced with the original built-in parameters and the calibrated ost.yaml needs to be renamed camera_Info.yaml, then replace the original camera_Info.yaml, Docker terminal input,

```
#First, copy the file to/opt/ros/foxy/share/USB_Cam/config  
sudo cp ost.yaml /opt/ros/foxy/share/usb_cam/config  
#Switch to/opt/ros/foxy/share/USB_ Under the cam/config directory  
cd /opt/ros/foxy/share/usb_cam/config  
#Back up the original camera_Info.yaml  
sudo mv camera_info.yaml camera_info_BK.yaml  
#Rename ost.yaml to camera_Info.yaml  
sudo mv ost.yaml camera_info.yaml
```