

# Camera calibration (USB)

## Camera calibration (USB)

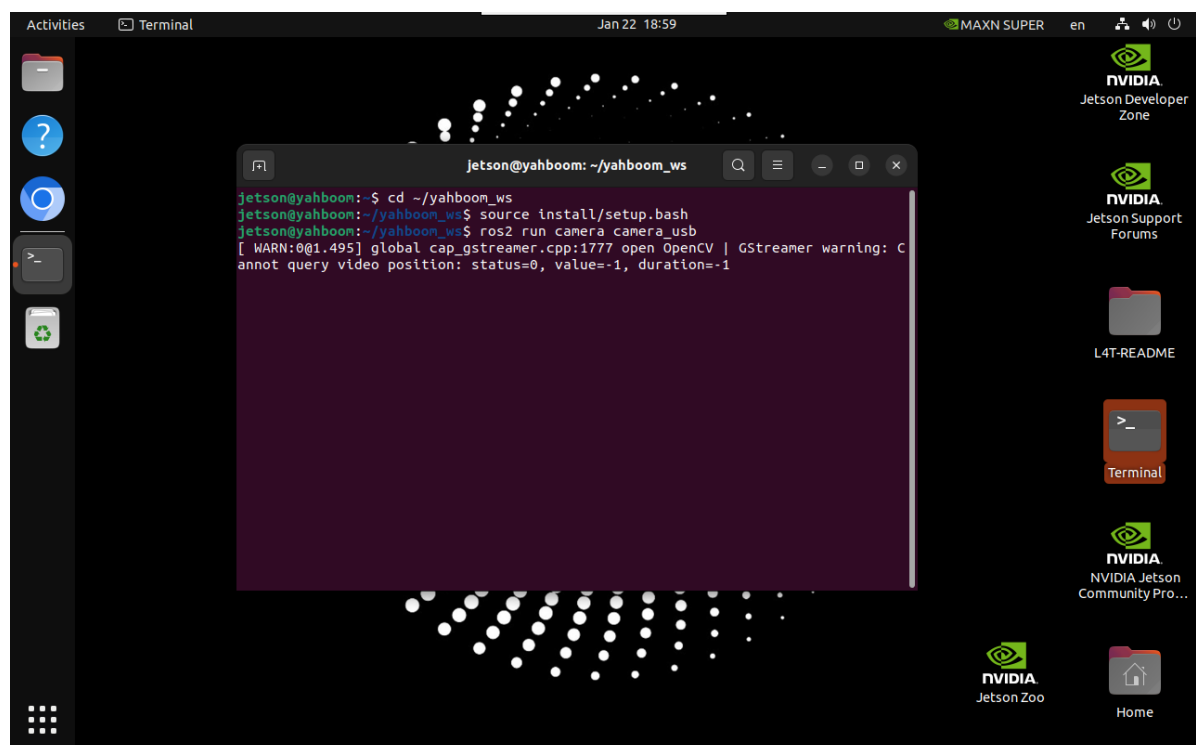
1. Start the camera
2. Image calibration
  - 2.1. Calibration board
  - 2.2. View topics
  - 2.3. Image calibration
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## 1. Start the camera

```
cd ~/yahboom_ws
```

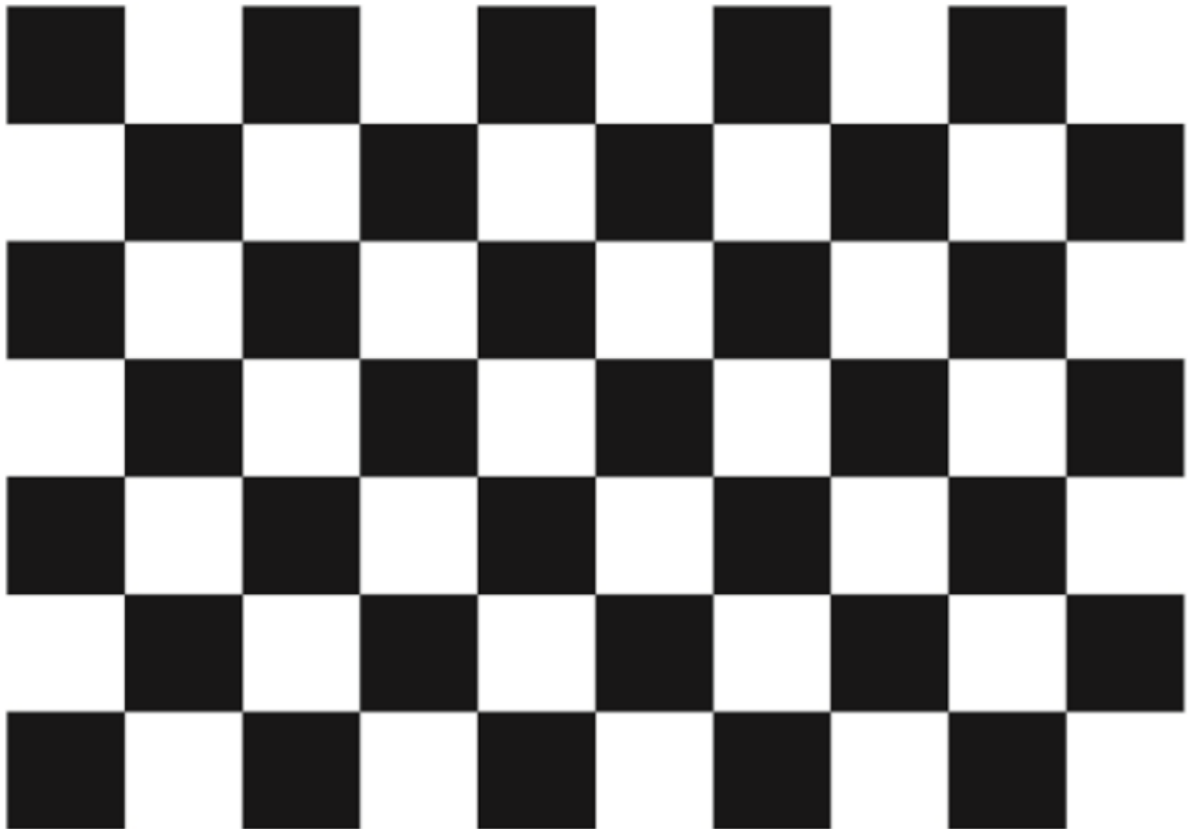
```
source install/setup.bash
```

```
ros2 run camera camera_usb
```



## 2. Image calibration

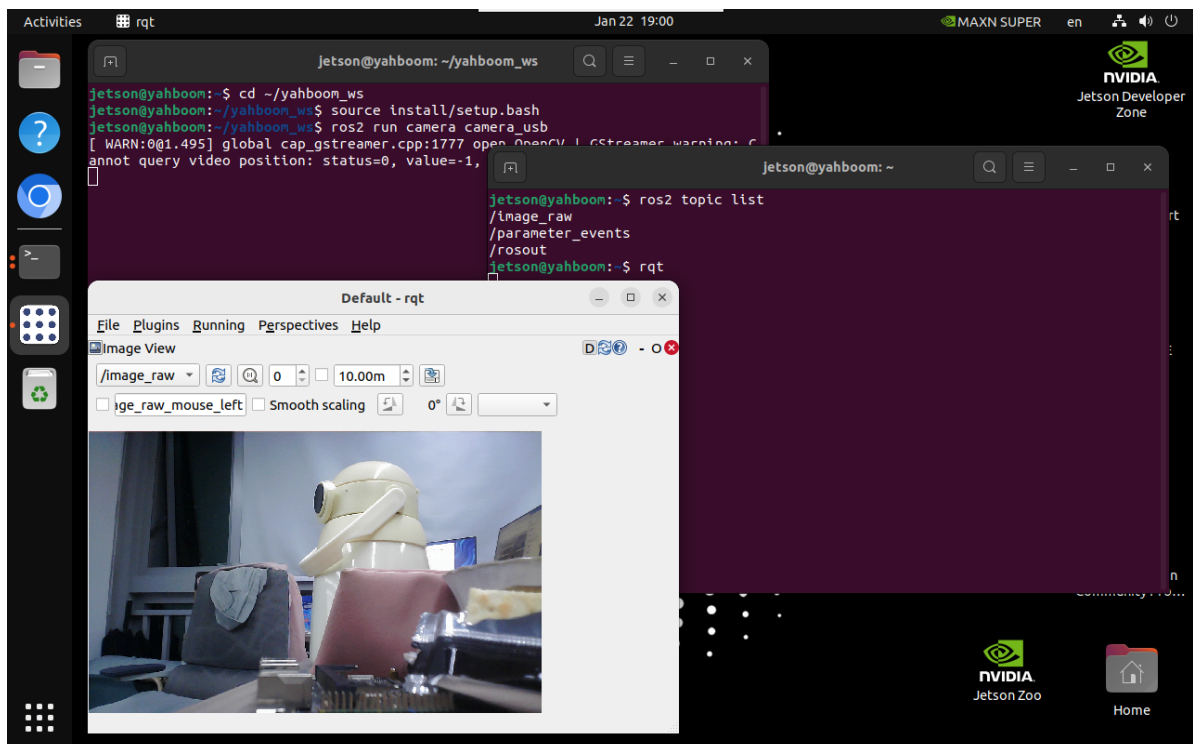
## 2.1. Calibration board



7×10 | Size: 20mm

## 2.2. View topics

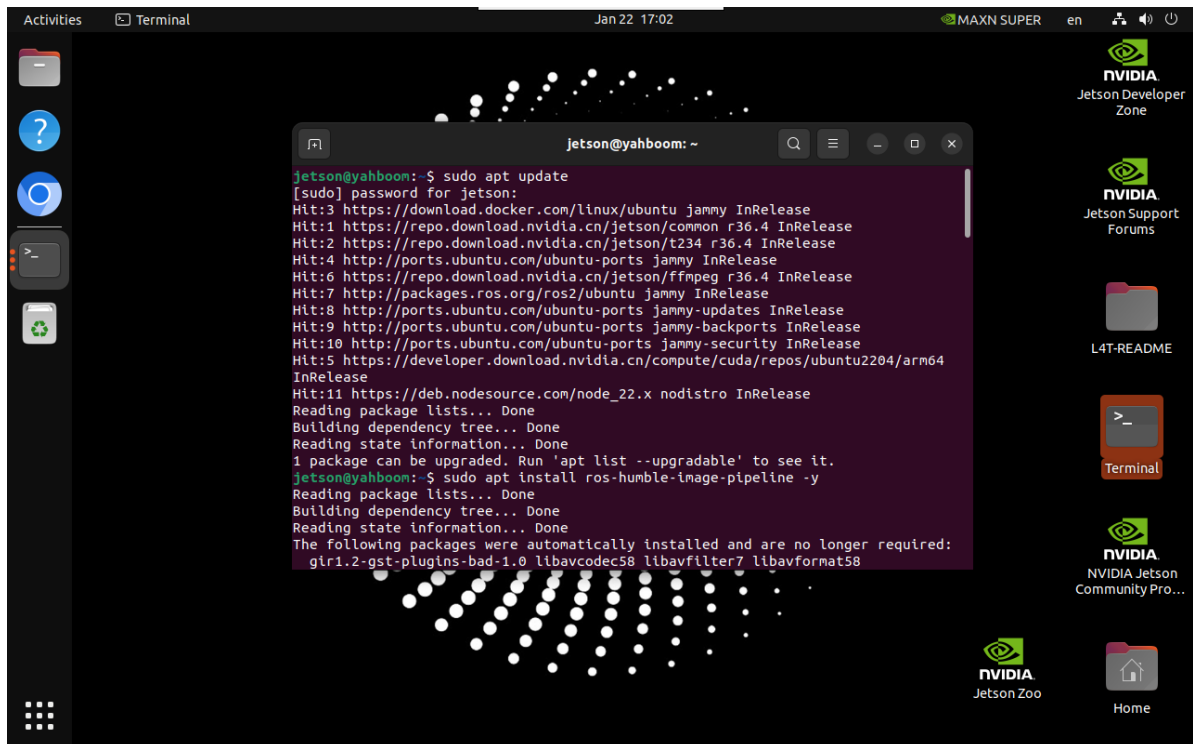
```
ros2 topic list
```



## 2.3. Image calibration

### 2.3.1. Install the image calibration tool

```
sudo apt update
sudo apt install ros-humble-image-pipeline -y
```



### 2.3.2. Start the image calibration tool

Start the ROS2 camera calibration tool `camera_calibration` and perform camera calibration:  
Before calibration, you need to start the camera first

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

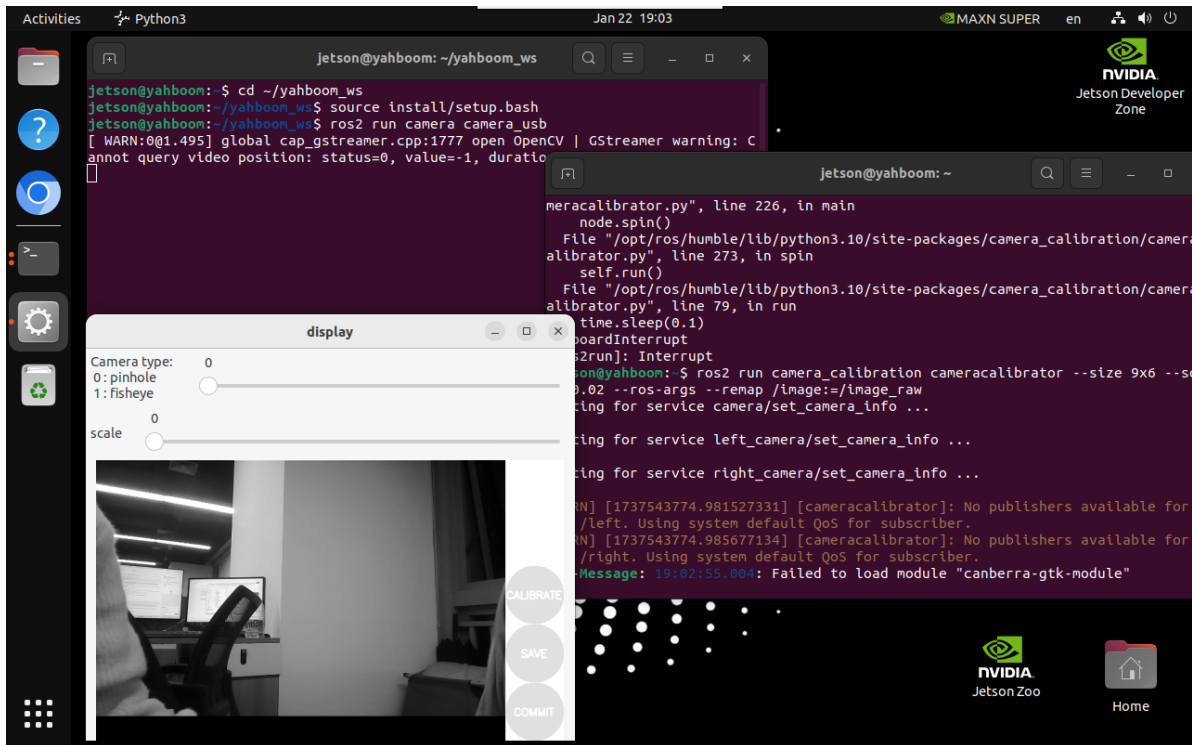
#### Parameter Description

`--size`: The number of inner corner points of the chessboard → 9 rows and 6 columns of inner corner points

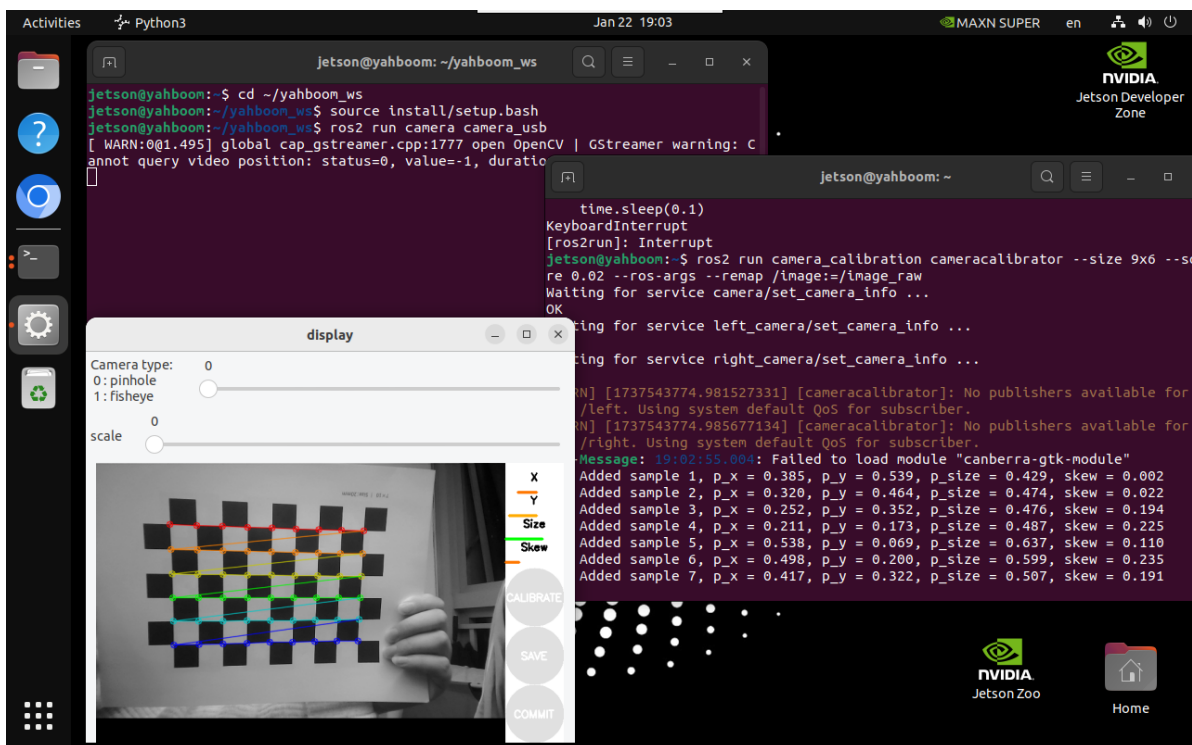
`--square`: The side length of the chessboard → 0.02 meters

`--ros-args`: Passing ROS parameters

`--remap`: Topic remapping → `/image_raw` as image input stream



### 2.3.3 Calibration process



#### Parameter Description

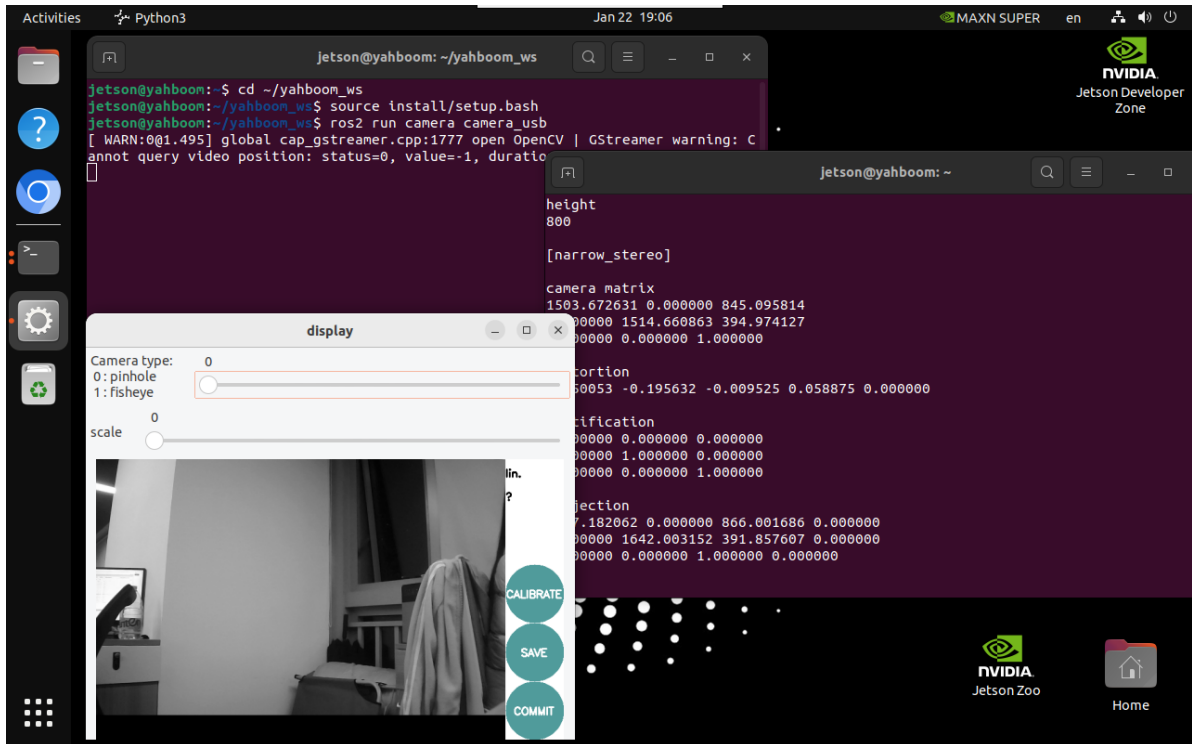
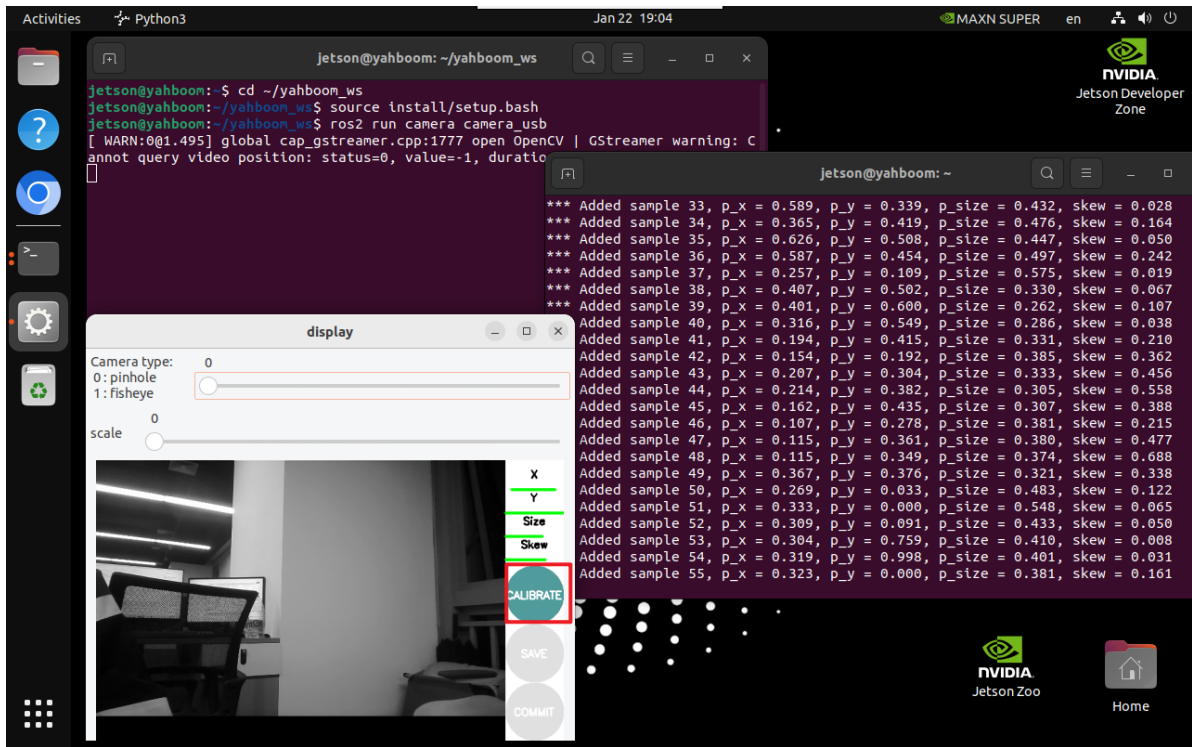
**X**: The chessboard moves left and right in the camera's field of view

**Y**: The chessboard moves up and down in the camera's field of view

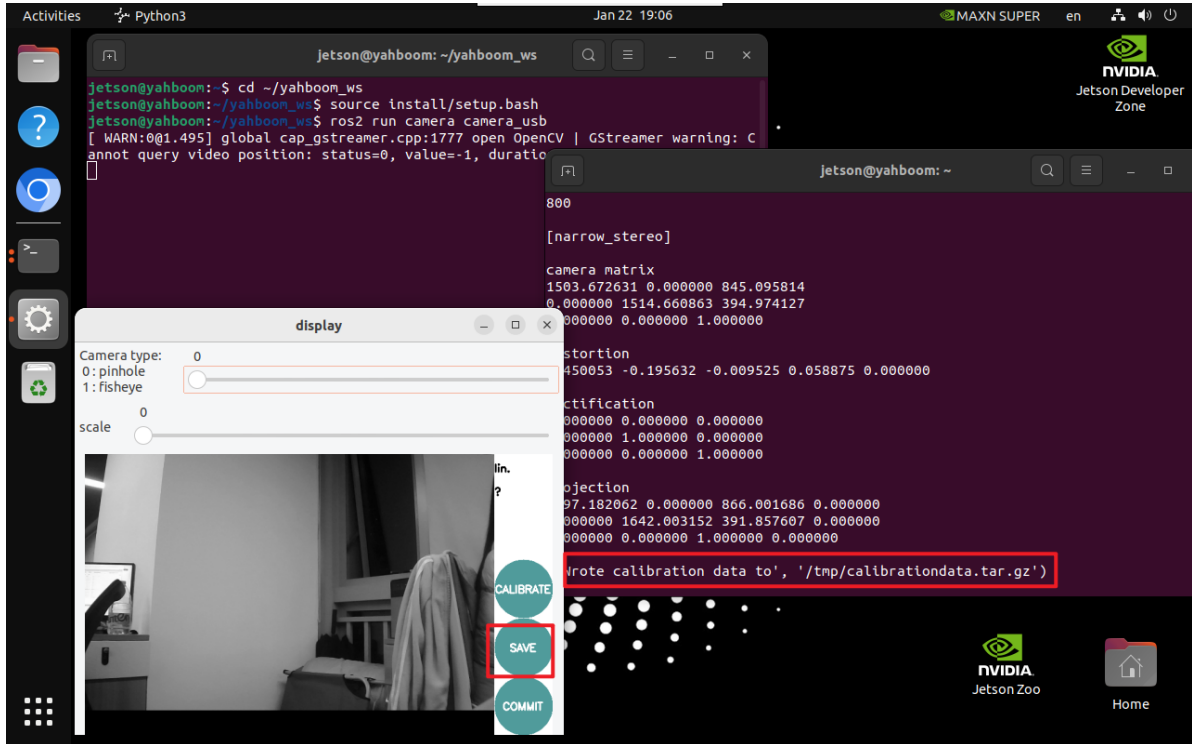
**size**: The chessboard moves back and forth in the camera's field of view

**skew**: Tilt and rotate of the chessboard in the camera's field of view

When **X**, **Y**, **Size**, and **skew** turn green, you can click **CALIBRATE** to calculate the camera internal parameters: The more pictures you calibrate, the longer it takes, and the program may get stuck.



After calibration, click **SAVE** to save the results!



Close the program after successful saving!

## 2.3.4, Calibration results

Default save location and file name of calibration results:

```
/tmp/calibrationdata.tar.gz
```

Copy and decompress the calibration results:

```
sudo mv /tmp/calibrationdata.tar.gz ~  
mkdir calibrationdata  
tar -xvzf calibrationdata.tar.gz -C ~/calibrationdata
```

The decompressed files contain the calibration `*.png`, `ost.yaml` and `ost.txt` files. We mainly copy the data in the `ost.yaml` file to the `camera_usb.yaml` file.

### `ost.yaml`

Replace the `camera_usb.yaml` file data with the `image_width`, `image_height`, `data` in `camera_matrix`, `data` in `projection_matrix`, and `data` in `distortion_coefficients`.

```
image_width: 1280  
image_height: 800  
camera_name: narrow_stereo  
camera_matrix:  
  rows: 3  
  cols: 3  
  data: [2126.24686, 0.0, 1045.90416,  
         0.0, 2038.73134, 292.1827,  
         0.0, 0.0, 1.0]  
distortion_model: plumb_bob  
distortion_coefficients:  
  rows: 1
```

```

    cols: 5
    data: [0.618718, -0.496057, -0.038096, 0.134905, 0.000000]
rectification_matrix:
  rows: 3
  cols: 3
  data: [1., 0., 0.,
         0., 1., 0.,
         0., 0., 1.]
projection_matrix:
  rows: 3
  cols: 4
  data: [2049.23772,    0.    , 1082.02717,    0.    ,
         0.    , 2153.52835,  282.33049,    0.    ,
         0.    ,    0.    ,    1.    ,    0.    ]

```

## camera\_csi.yaml

Modified file:

```

%YAML:1.0
---
image_width: 1920
image_height: 1080
camera_name: camera
camera_matrix: !!opencv-matrix
  rows: 3
  cols: 3
  dt: d
  data: [2126.24686,    0.    , 1045.90416,
         0.    , 2038.73134,  292.1827 ,
         0.    ,    0.    ,    1.    ]
distortion_model: plumb_bob
distortion_coefficients: !!opencv-matrix
  rows: 1
  cols: 5
  dt: d
  data: [0.618718, -0.496057, -0.038096, 0.134905, 0.000000]
rectification_matrix:
  rows: 3
  cols: 3
  data: [1., 0., 0.,
         0., 1., 0.,
         0., 0., 1.]
projection_matrix:
  rows: 3
  cols: 4
  data: [2049.23772,    0.    , 1082.02717,    0.    ,
         0.    , 2153.52835,  282.33049,    0.    ,
         0.    ,    0.    ,    1.    ,    0.    ]

```