

## 6、Face Tracking

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## 6.1、Face detection Introduction

In OpenCV, face detection in video only reads each frame of image from the camera, and then uses the static image detection method for detection. Face detection requires the classifier:

@ Face detector(default): haarcascade\_frontalface\_default.xml

@ Face detector(fast Harr): haarcascade\_frontalface\_alt2.xml

@ Face detector(Side view): haarcascade\_profileface.xml

@ Eye detector(left eye): haarcascade\_lefteye\_2splits.xml

@ Eye detector(right eye): haarcascade\_righteye\_2splits.xml

@ Mouth detector: haarcascade\_mcs\_mouth.xml

@ Nose detector: haarcascade\_mcs\_nose.xml

@ Body detector: haarcascade\_fullbody.xml

@ Face detector(fast LBP): lbpcascade\_frontalface.xml

@ Only open eyes can be detected: haarcascade\_eye.xml

@ Only person with glasses can be detected: haarcascade\_eye\_tree\_eyeglasses.xml

@ <https://github.com/opencv/opencv/tree/master/data> Download classifier file link

haarcascade\_profileface.xml is the cascading data of Haar. This xml can be obtained from this link [https://github.com/opencv/opencv/blob/master/data/haarcascades/haarcascade\\_profileface.xml](https://github.com/opencv/opencv/blob/master/data/haarcascades/haarcascade_profileface.xml)

Next, we can start face detection by `face_cascade.detectMultiScale()`. We need to convert the image into a grayscale, then, transfer each frame of the image obtained by the camera into `.detectMultiScale()`.

(Note: we need to ensure enter the correct location of `haarcascade_profileface.xml` correctly.)

OpenCV API function:

**`detectMultiScale(const Mat& image, vector& objects, double scaleFactor=1.1,int minNeighbors, int flag,cvSize)`**

Parameter analysis:

image --- Input grayscale image

objects --- The rectangular box vector set of the detected object

scaleFactor --- Each scale parameter in the image scale, the default value is 1.1.

minNeighbors --- Default is 3.

minNeighbors --- The default value of 3 indicates that there are at least 3 overlap detections, so we think that the face is exist.

minSize --- Target minimum size

maxSize --- Target maximum size

## 6.2. Operation steps

### 6.2.1. Start

#### jetson motherboard/Raspberry Pi 4B

Start the face recognition tutorial (robot side)

```
roslaunch transbot_bringup bringup.launch  
roslaunch transbot_facetracker face_follow.py
```

#### Raspberry Pi 5

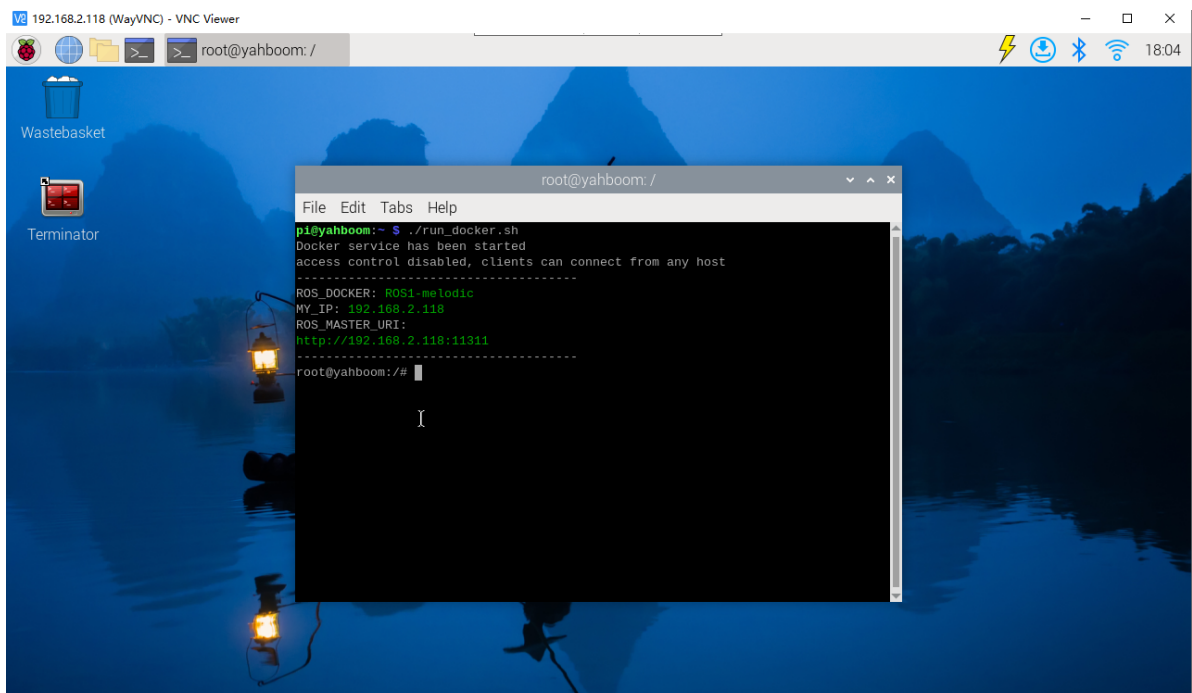
**Before running, please confirm that the large program has been permanently closed**

Enter docker

**Note: If there is a terminal that automatically starts docker, or there is a docker terminal that has been opened, you can directly enter the docker terminal to run the command, and there is no need to manually start docker**

Start docker manually

```
./run_docker.sh
```



```
roslaunch transbot_bringup bringup.launch
```

Enter the same docker from multiple terminals

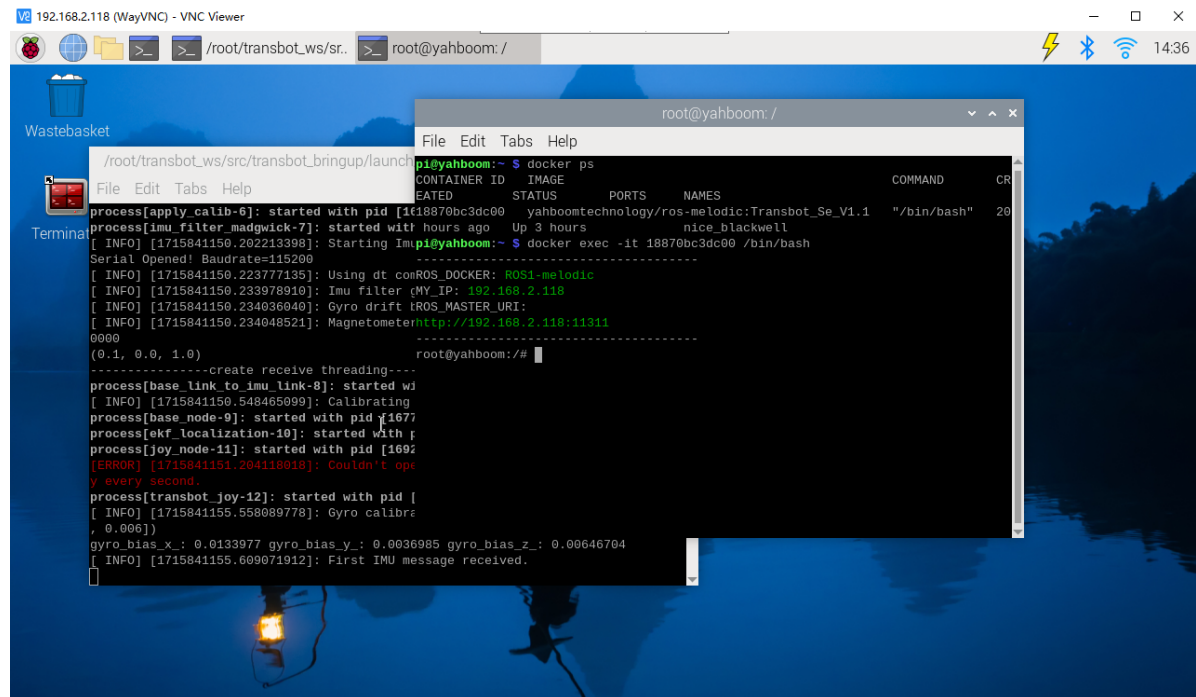
Keep the program of the previous docker terminal running and open a new terminal

Enter the following command

```
docker ps
```

Enter the same docker and use the following 18870bc3dc00 to modify the ID displayed on the actual terminal.

```
docker exec -it 18870bc3dc00 /bin/bash
```



```
roslaunch transbot_facetracker face_follow.py
```

## 6.2.2. PID adjustment

Dynamic parameter tuning

jetson motherboard/Raspberry Pi 4B

```
roslaunch rqt_reconfigure rqt_reconfigure
```

## Raspberry Pi 5

Enter the same docker from multiple terminals

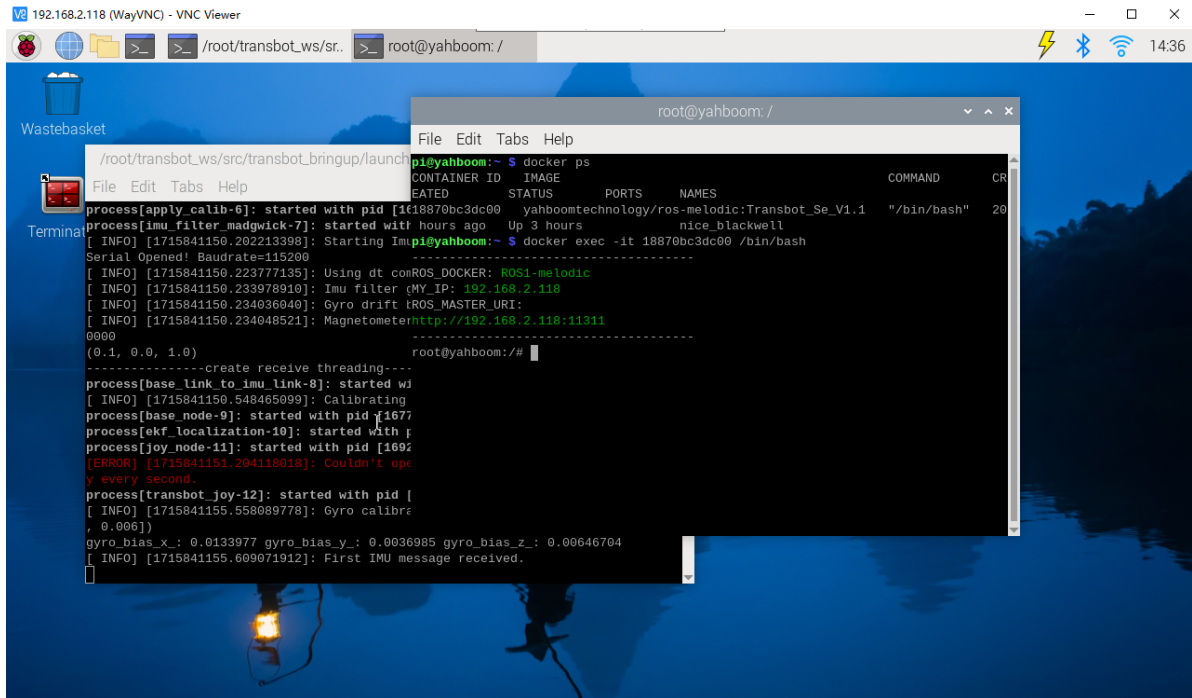
Keep the program of the previous docker terminal running and open a new terminal

Enter the following command

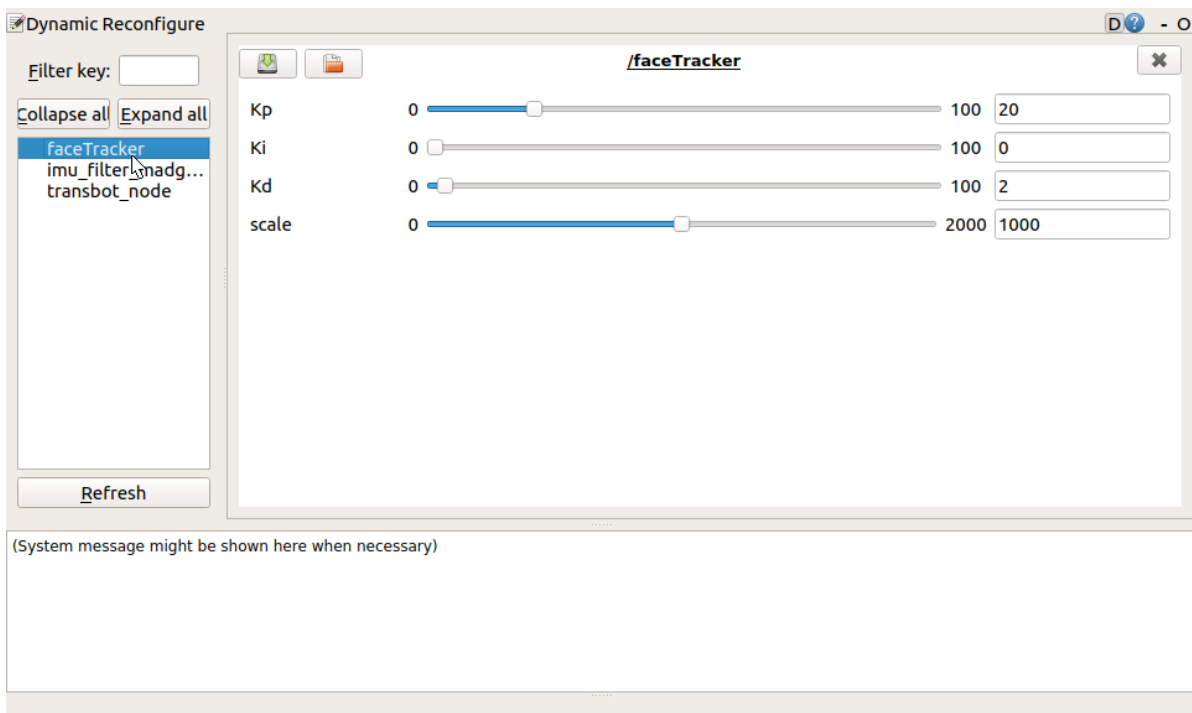
```
docker ps
```

Enter the same docker and use the following 18870bc3dc00 to modify the ID displayed on the actual terminal.

```
docker exec -it 18870bc3dc00 /bin/bash
```



```
roslaunch rqt_reconfigure rqt_reconfigure
```



Select the [faceTracker] node to adjust the four parameters [Kp], [Ki], [Kd], and [scale]. When the slider is always being dragged, data will not be transferred to the system until it is released; you can also select a row and then slide the mouse wheel.

### 6.2.3. Face tracking

After running the program, when a face is displayed on the screen and a box appears surrounding the face, the PTZ camera will follow the movement of the face.

