Object recognition and tracking

Note: The VM and ROS-wifi image transfer module must be consistent with the microROS control board ROS_DOMAIN_ID and set the value to 20. You can check [MicroROS control board Parameter configuration] to set the microROS control board ROS_DOMAIN_ID. Check the tutorial Connecting to MicroROS Agents to see if the ids are the same.

1、Program function specification

After the program starts, select the object that needs to be tracked by the mouse, press the space bar, and the PTZ steering gear of the car enters the tracking mode. The head of the car will follow the tracked object and always ensure that the tracked object remains in the center of the picture.

2、Operation procedure

2.1、activate

Enter docker, terminal type,

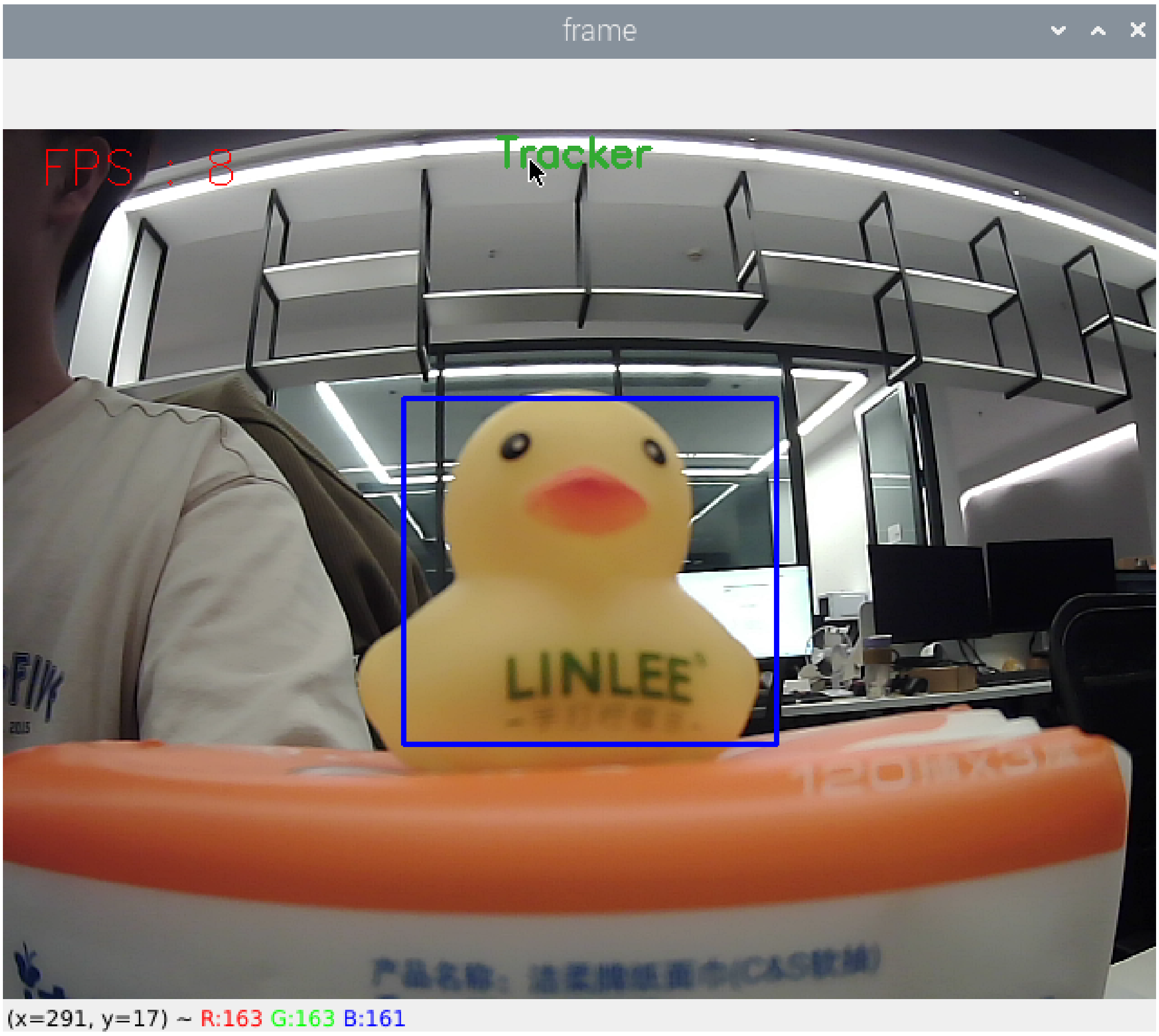
```
ros2 run yahboom_esp32ai_car mono_Tracker
```

If the Angle of the camera is not at this Angle, please press CTRL+C to end the program and run again, this is because the network delay causes the Angle of sending the steering gear to lose packets

If the camera picture image appears upside down, you need to see **3. Camera picture correction (must see)** document itself correction, the experiment is no longer described.

2.2、recognize

After startup, enter the selection mode, select the location of the target with the mouse, as shown in the figure below, release it to start recognition.



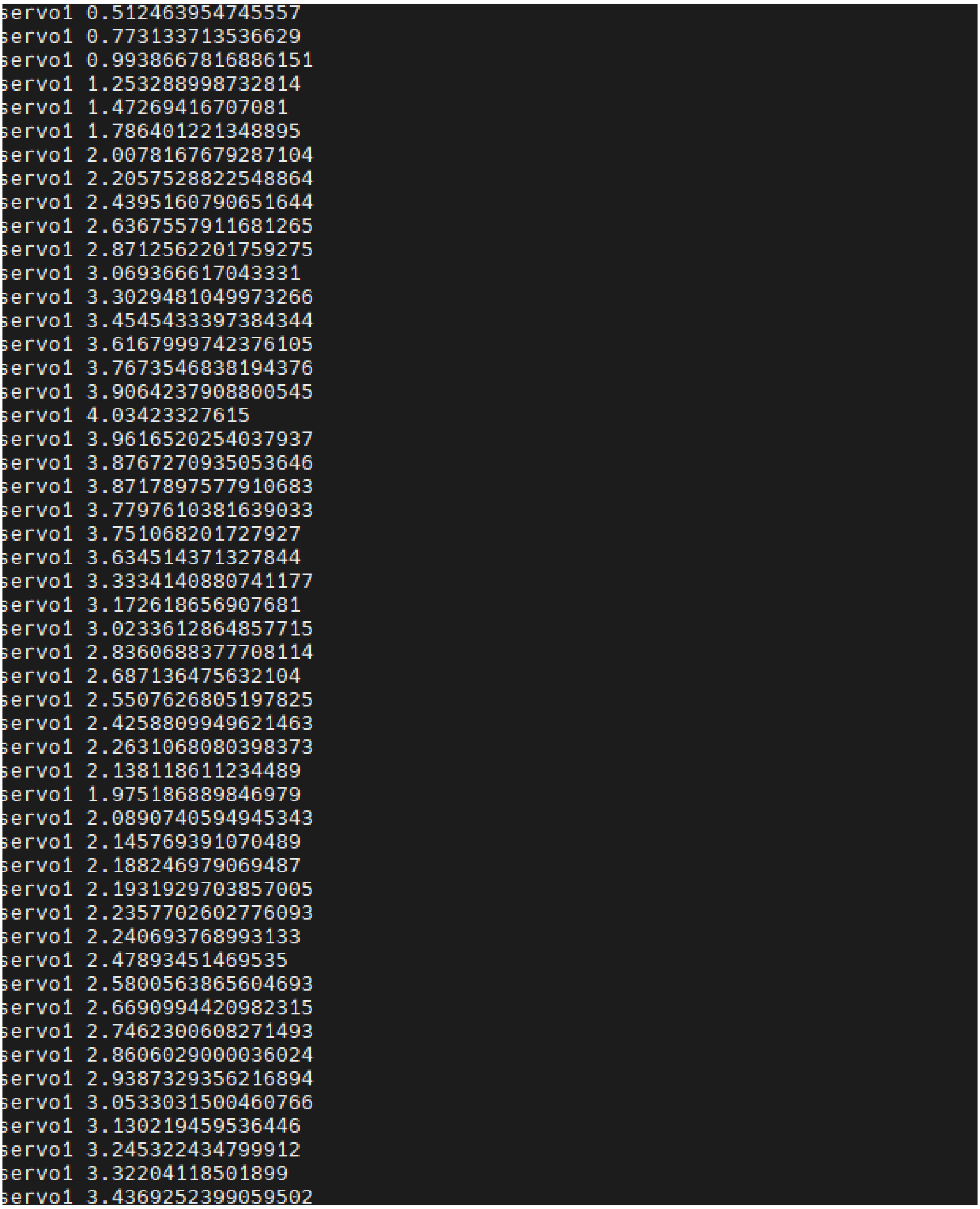
Keyboard key control：

[r]： To select the mode, use the mouse to select the area to identify the target, as shown in the figure above.

[q]： Exit procedure.

[Space bar]： Target tracking; Move the target slowly while following, moving too fast will lose the target.

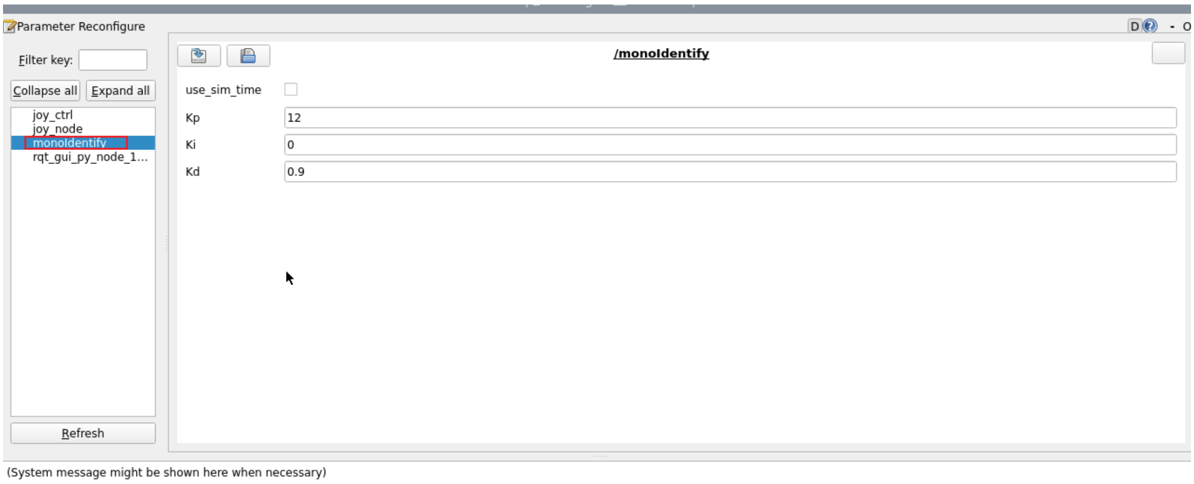
Press the space to see the motion Angle calculated by the pid.



```
servo1 0.512463954745557
servo1 0.773133713536629
servo1 0.9938667816886151
servo1 1.253288998732814
servo1 1.47269416707081
servo1 1.786401221348895
servo1 2.0078167679287104
servo1 2.2057528822548864
servo1 2.4395160790651644
servo1 2.6367557911681265
servo1 2.8712562201759275
servo1 3.069366617043331
servo1 3.3029481049973266
servo1 3.4545433397384344
servo1 3.6167999742376105
servo1 3.7673546838194376
servo1 3.9064237908800545
servo1 4.03423327615
servo1 3.9616520254037937
servo1 3.8767270935053646
servo1 3.8717897577910683
servo1 3.7797610381639033
servo1 3.751068201727927
servo1 3.634514371327844
servo1 3.3334140880741177
servo1 3.172618656907681
servo1 3.0233612864857715
servo1 2.8360688377708114
servo1 2.687136475632104
servo1 2.5507626805197825
servo1 2.4258809949621463
servo1 2.2631068080398373
servo1 2.138118611234489
servo1 1.975186889846979
servo1 2.0890740594945343
servo1 2.145769391070489
servo1 2.188246979069487
servo1 2.1931929703857005
servo1 2.2357702602776093
servo1 2.240693768993133
servo1 2.47893451469535
servo1 2.5800563865604693
servo1 2.6690994420982315
servo1 2.7462300608271493
servo1 2.8606029000036024
servo1 2.9387329356216894
servo1 3.0533031500460766
servo1 3.130219459536446
servo1 3.245322434799912
servo1 3.32204118501899
servo1 3.4369252399059502
```

You can also debug PID parameters using dynamic parameter adjuster, terminal input,

```
ros2 run rqt_reconfigure rqt_reconfigure
```



use_sim_time ☐

Kp 12

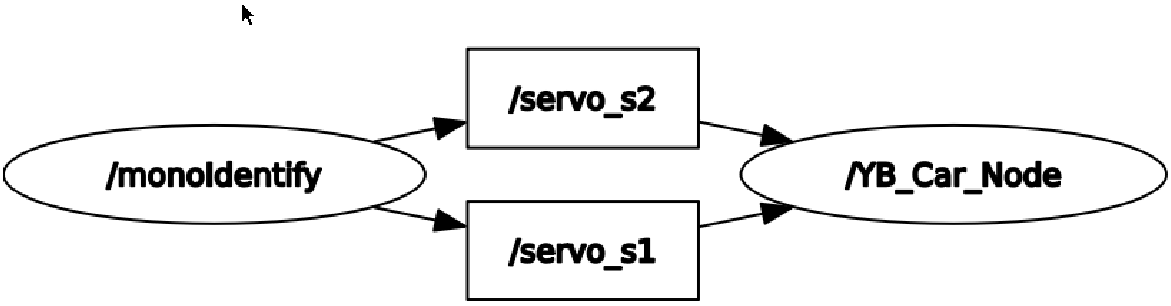
Ki 0

Kd 0.9

The adjustable parameters include PID parameters of the car head. After modifying the parameters, click "refresh" to refresh the data.

2.3、View the node topic communication graph

You can view the topic communication between nodes by running the following command,



3、Core code

The principle of functional implementation is similar to color tracking, which is to calculate the rotation Angle of s1 and s2 steering gear according to the central coordinates of the target, and then release it to the chassis, and part of the code is put under,

```
if len(contours) != 0:
    areas = []
    for c in range(len(contours)): areas.append(cv.contourArea(contours[c]))
    max_id = areas.index(max(areas))
    max_rect = cv.minAreaRect(contours[max_id])
    max_box = cv.boxPoints(max_rect)
    max_box = np.int0(max_box)
    (color_x, color_y), color_radius = cv.minEnclosingCircle(max_box)

center_x = targEnd_x / 2 + targBegin_x / 2
center_y = targEnd_y / 2 + targBegin_y / 2
width = targEnd_x - targBegin_x
high = targEnd_y - targBegin_y
self.point_pose = (center_x, center_y, min(width, high))
if self.Track_state == 'tracking':
   if self.circle[2] != 0: threading.Thread(target=self.execute, args=(self.circle[0], self.circle[1])).start()

[x_Pid, y_Pid] = self.PID_controller.update([point_x - 320, point_y - 240])
   if self.img_flip == True:
        self.target_servox -= x_Pid
        self.target_servoy += y_Pid
   else:
        self.target_servox -= x_Pid
        self.target_servoy += y_Pid
   if self.target_servox >= 45:
     self.target_servox = 45
   elif self.target_servox <= -45:
     self.target_servox = -45
   if self.target_servoy >= 40:
     self.target_servoy = 40
   elif self.target_servoy <= -90:
     self.target_servoy = -90
```