3.HD camera color tracking (robotic arm)

3.1、Introduction

The monocular color tracking (chassis) of the Transbot se robot can recognize multiple colors at any time and independently store the currently recognized color. The robot arm tracks the color up and down, and the car rotates left and right to track the color. When the color is far away from the car, it will actively follow.

The color tracking of the Transbot se robot can also realize the function of real-time HSV regulation. By adjusting the high and low thresholds of HSV, the interfering colors can be filtered out, so that the square can be identified ideally in a complex environment. If the color picking effect is not ideal At this time, we need to move the car to a different environment to calibrate it, so that we can recognize the color we need in a complex environment.

- **HSV**

H: 0 — 180

S: 0 — 255

V: 0 — 255

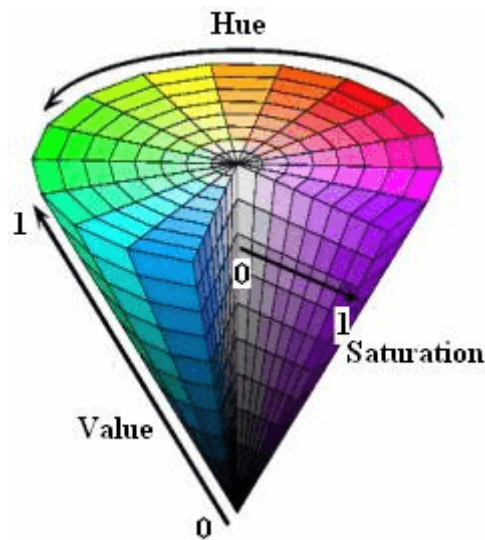Part of the red is classified as the purple range here:

	black	gray	white	red		orange	yellow	green	verdant	blue	purple
hmin	0	0	0	0	156	11	26	35	78	100	125
hmax	180	180	180	10	180	25	34.	77	99	124	155
smin	0	0	0		43	43	43	43	43	43	43
smax	255	43	30		255	255	255	255	255	255	255
vmin	0	46	221		46	46	46	46	46	46	46
vmax	46	220	255		255	255	255	255	255	255	255

- **HSV**
- **Lightness V**
  - **Saturation S**
- **Hue H**

3.2、 Steps

Note: The [R2] of the handle remote controller can [Pause/Open] for all functions of robot car.The color recognition object used in the routine is 18cm long and 15cm wide. Objects smaller than this size need to refer to "2.2.3, Dynamic parameter debugging" to modify the value of minDist. The smaller the object, the smaller the modified value. Due to the use of ordinary cameras. The effect will be affected by the light.

3.2.1、 Start up

Start the chassis driver control (robot side)

```
roslaunch transbot_track TrackSrv.launch
```

Method 1

Start HD camera (robot side)

```
roslaunch usb_cam usb_cam-test.launch
```

Start HD camera color tracking control (virtual machine)

```
roslaunch transbot_track Tracker.launch VideoSwitch:=false tracker_type:=color
```

Method 2

Note: press 【q】 key to exit.

 (robot side)

```
roslaunch transbot_track Tracker.launch VideoSwitch:=true tracker_type:=color
```

This method can only be activated in the master controller that the camera is connected.

- VideoSwitch parameter: whether to use the camera function package to start; for example: start usb_cam-test.launch, this parameter must be set to true; otherwise, it is false.
- tracker_type parameter: function gameplay, select color tracking.

Set the parameters according to your needs, and you can also modify the launch file directly, so you don't need to attach parameters when you start.

3.2.2、Identify

After the startup is complete, the system defaults to [Target Detection Mode], and you need to press [r] to enter the color selection mode. In the color selection mode, use the mouse to select the position of the color block, as shown in the figure below, and release it to start recognition. As shown below:
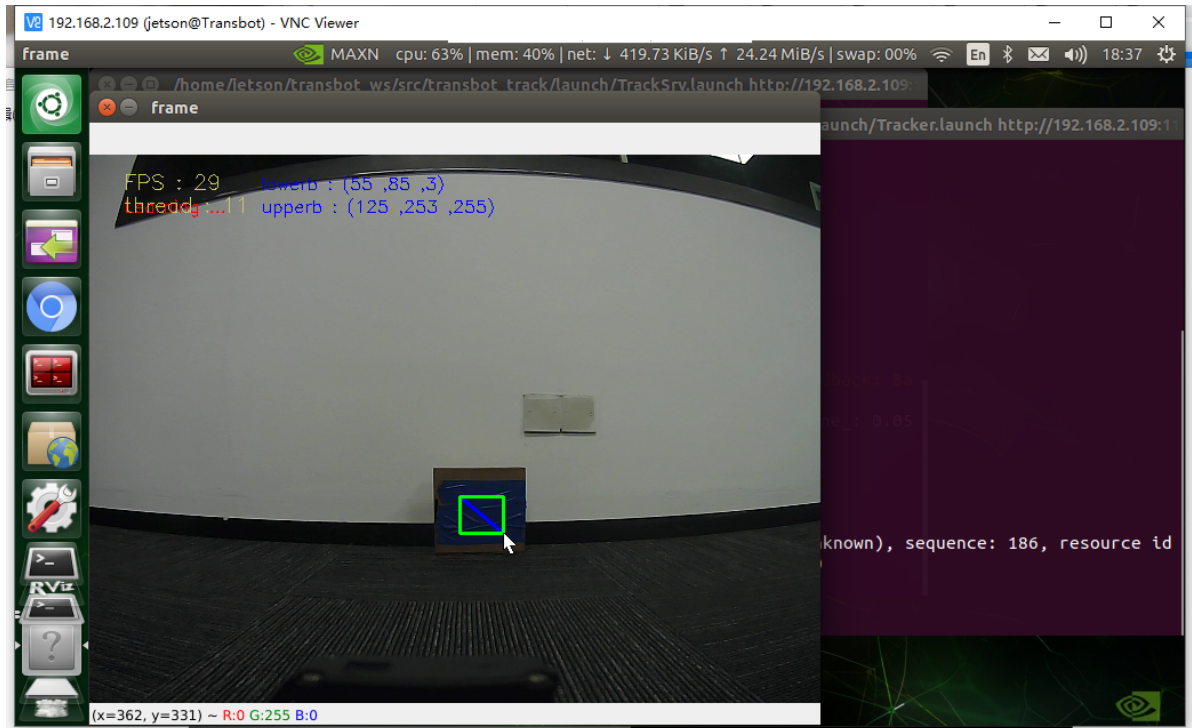
Keyboard key control:

【r】: Color selection mode, the mouse can be used to select the area of the color to be recognized (cannot exceed the area range).If the robot arm blocks the camera, press the 【r】 key to reset the robot arm.

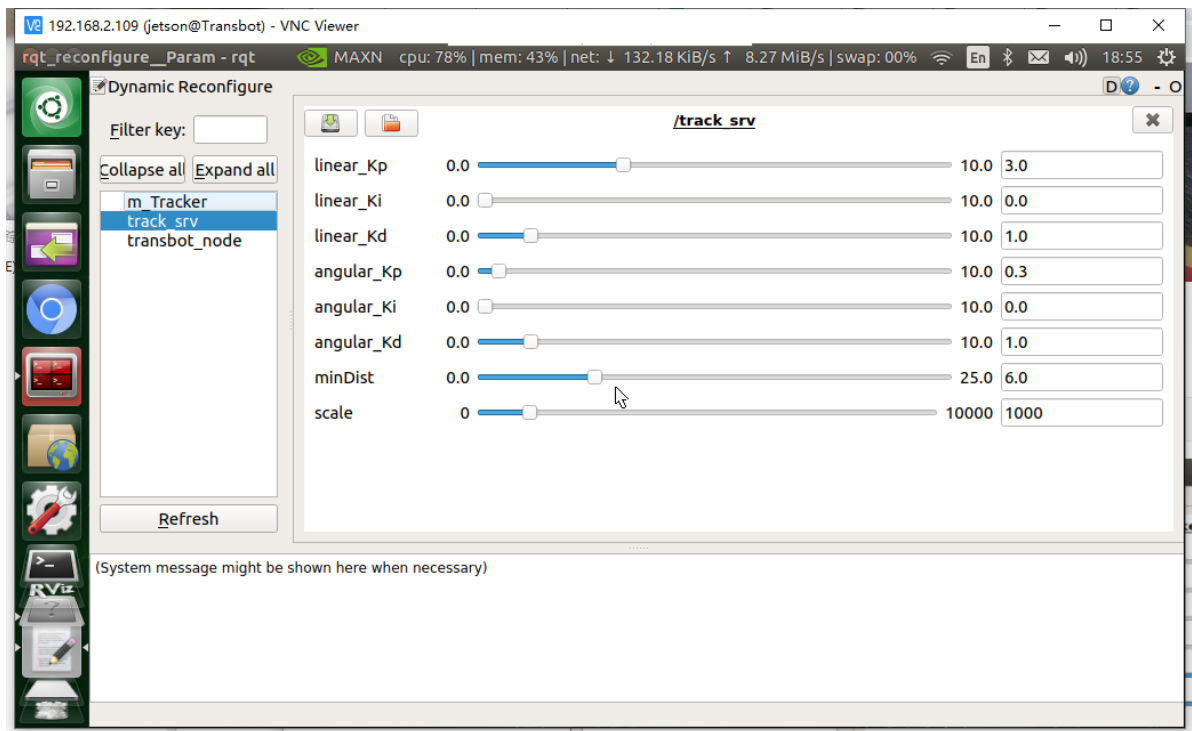【i】: Target detection mode. Color map on the left (Color), binary map on the right (Binary).

【q】: Exit the program.

【Space key】: Color follow.

3.2.3 、Dynamic parameter debugging

Dynamic parameter

```
rosrun rqt_reconfigure rqt_reconfigure
```

3.2.3.1、following distance debugging
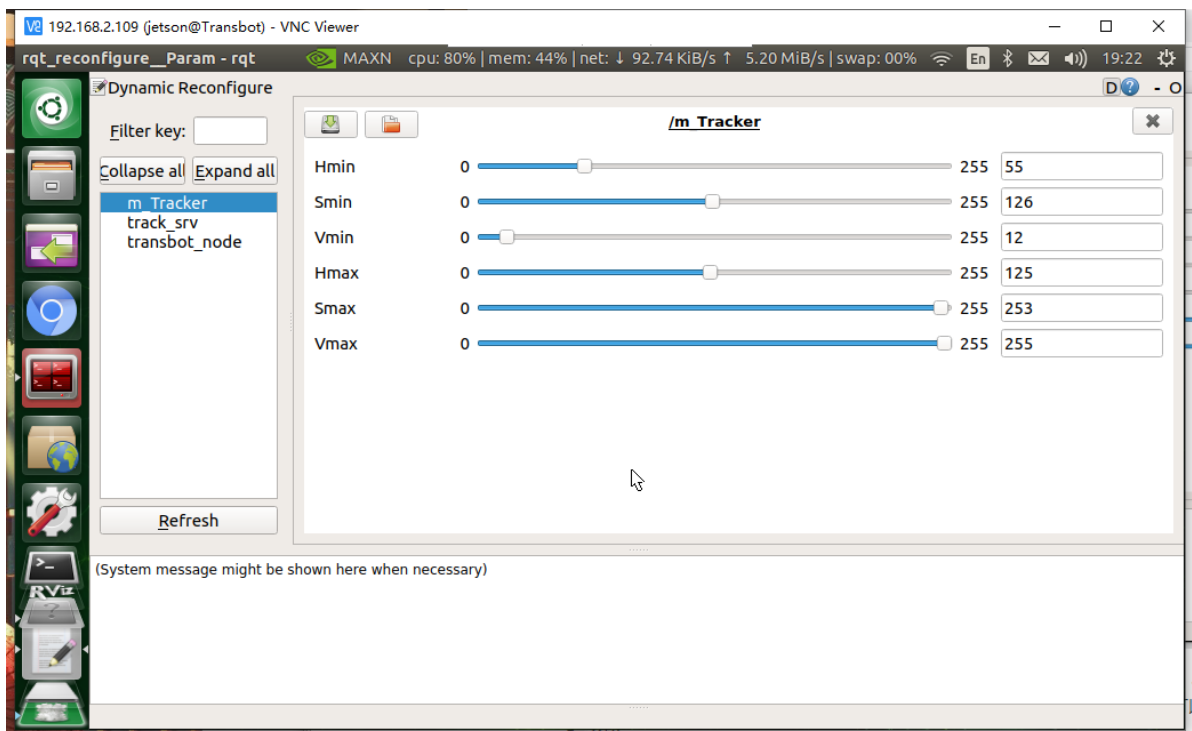
```
253
254        def move(self,x,distanceCM):
255            size = 80
256            velocity = 0
257            angular = 1.5
258            distance = 150
259            center_x = 320
```

The default distance value is 150, but if you want to change the distance to follow, you can change the distance value in line 258 of **~/transbot_ws/src/transbot_track/scripts/Tracker.py**

3.2.3.2.、Color Calibration

Select the [m_Tracker] node, generally only need to adjust [Hmin], [Smin], [Vmin], [Hmax], these four parameters can be well identified. The slide bar is always in the dragging state, and the data will not be transmitted to the system, it can only be released after it is released; you can also select a row, and then slide the mouse wheel.
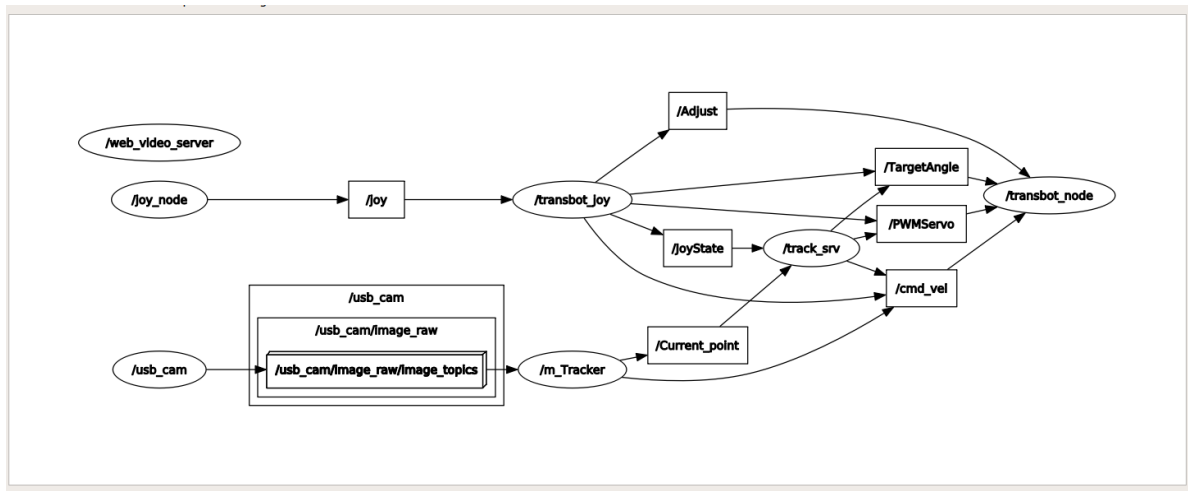
3.2.4、 Color follow

After identifying is ok, click [Space key] on the keyboard to execute the color following program.
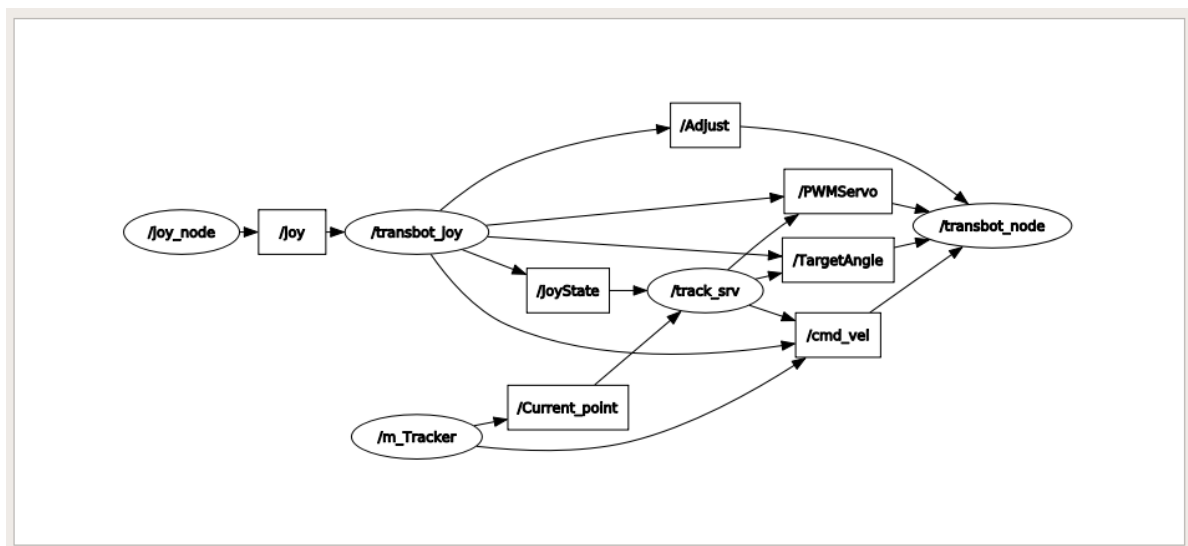
- View node

```
rqt_graph
```

- Method1--start up，node【m_Tracker】

Subscribe to image topics; publish gimbal servos, robotic arms, and chassis drive topics

- Method2--start up，node【m_Tracker】

Publish the topics of gimbal steering gear, robotic arm, and chassis drive.