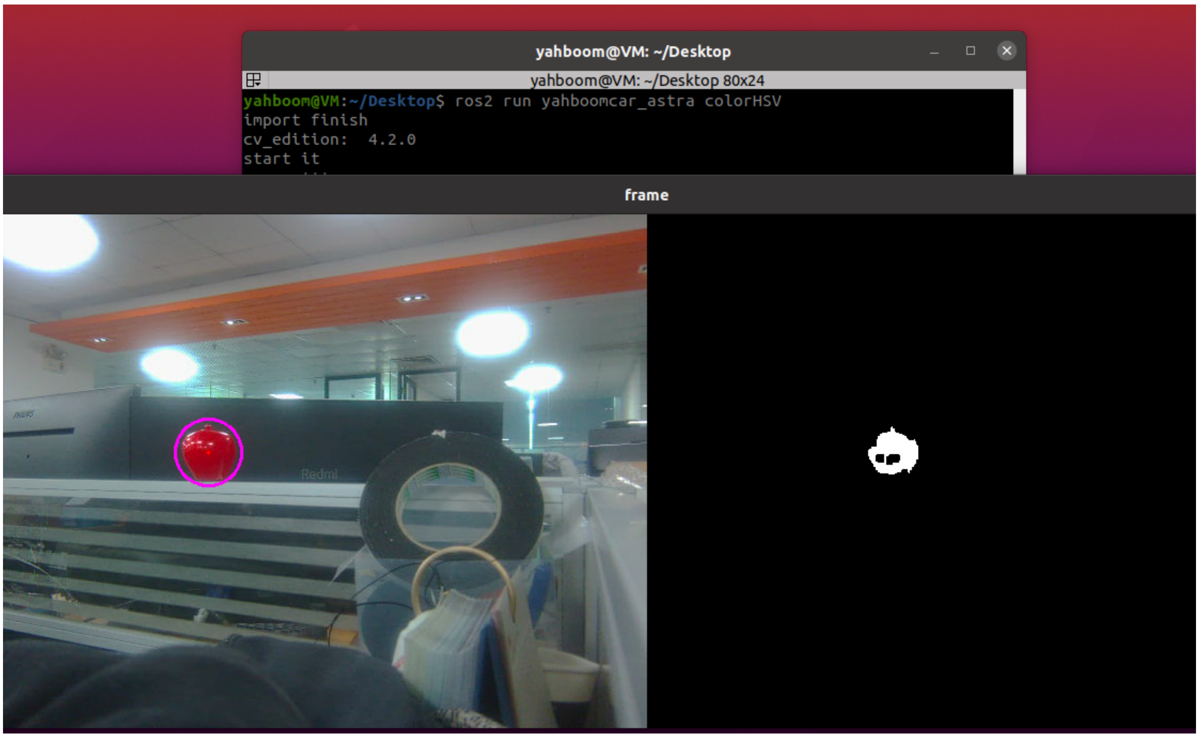
3. Color tracking

3.1. Program startup

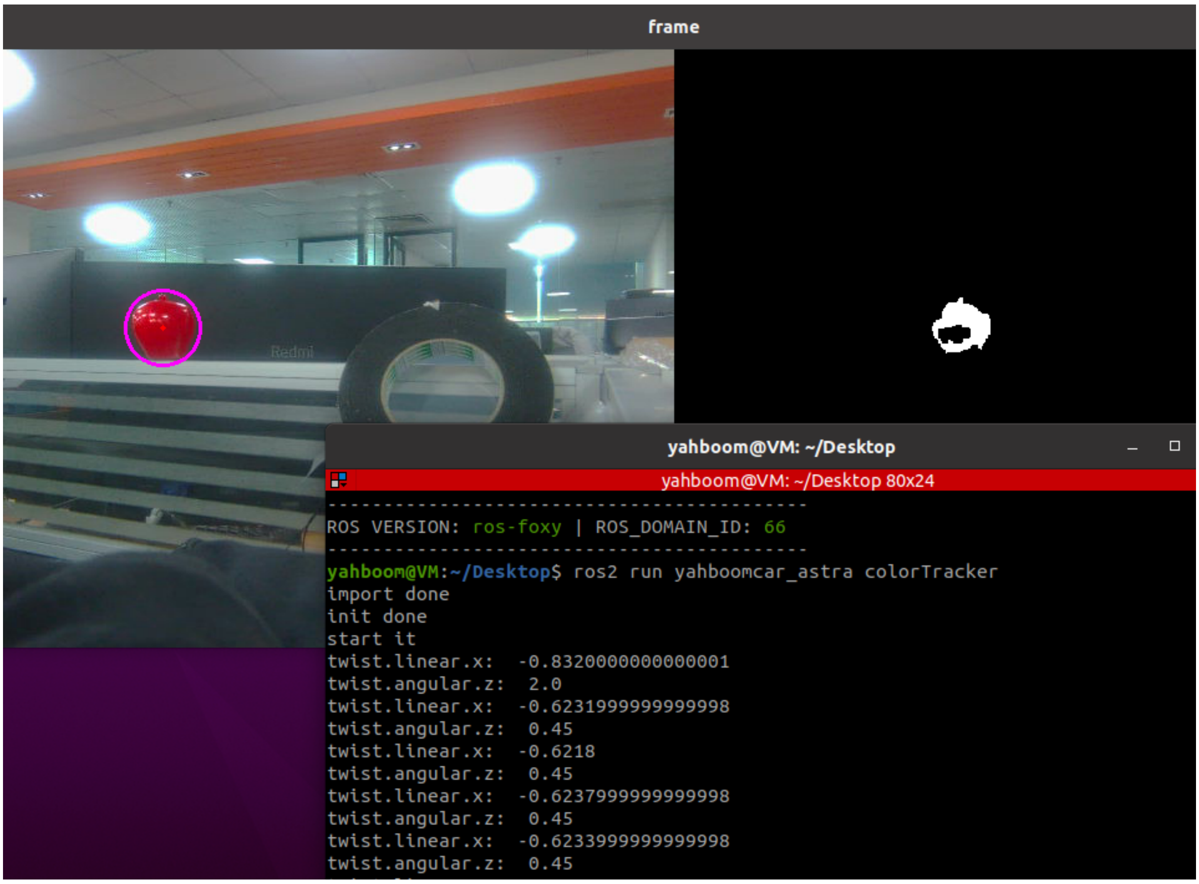
Terminal input,

```
#gemini camera startup
ros2 launch astra_camera gemini.launch.xml
ros2 run yahboomcar_astra colorHSV
ros2 run yahboomcar_astra colorTracker
```



```
yahboom@VM:~/Desktop$ ros2 run yahboomcar_astra colorHSV
import finish
cv_edition:  4.2.0
start it
```

After successful startup, the above screen will be displayed. The program will load the HSV value at the beginning, and then display the processed image. Press the [r] key to reselect the color, and use the mouse to frame the color to be tracked. The selected area can only have one color. After selecting the color to be tracked, the program processes the image and presses the space bar to start tracking. The terminal that starts colorTracker will display,

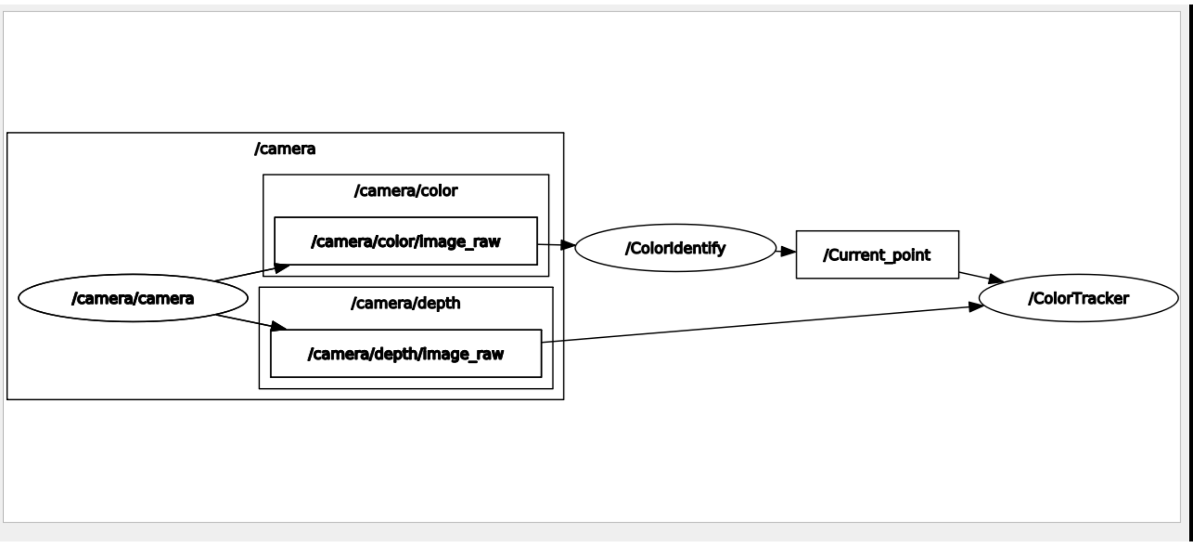


```
-------------------------------------------
ROS VERSION: ros-foxy | ROS_DOMAIN_ID: 66
-------------------------------------------
yahboom@VM:~/Desktop$ ros2 run yahboomcar_astra colorTracker
import done
init done
start it
twist.linear.x:  -0.8320000000000001
twist.angular.z:  2.0
twist.linear.x:  -0.6231999999999998
twist.angular.z:  0.45
twist.linear.x:  -0.6218
twist.angular.z:  0.45
twist.linear.x:  -0.6237999999999998
twist.angular.z:  0.45
twist.linear.x:  -0.6233999999999998
twist.angular.z:  0.45
```

This was originally intended to be run in conjunction with a robot. Programs without a driver chassis can only be verified by printing the speed that needs to be published. Move the selected object, and the printed linear speed and angular speed will change. The speed topic here is /cmd_vel. If a robot chassis driver subscribes to this node, the robot can be driven.

Check the communication between nodes and input in the terminal.

```
ros2 run rqt_graph rqt_graph
```



3.2, core code analysis

Code reference path,

```
~/orbbec_ws/src/yahboomcar_astra/yahboomcar_astra/colorHSV.py
~/orbbec_ws/src/yahboomcar_astra/yahboomcar_astra/colorTracker.py
```

3.2.1, colorHSV.py

This program has the following functions:

- Subscribe to camera image data;
- Get keyboard and mouse events for switching modes and picking colors;
- Process the image and publish the center coordinates of the tracked object and publish it

Some core codes are as follows,

```
#Create publishers and subscribers
self.pub_position = self.create_publisher(Position,"/Current_point", 10)
self.sub_img =
self.create_subscription(Image,'/camera/color/image_raw',self.handleTopic,1)
#Subscribe to the image callback function and pass the image to the process
function
frame, binary = self.process(frame, action)
#Get keyboard and mouse events and get the value of hsv;
if action == 32: self.Track_state = 'tracking'
elif action == ord('i') or action == ord('I'): self.Track_state =
"identify"
elif action == ord('r') or action == ord('R'): self.Reset()
elif action == ord('q') or action == ord('Q'): self.cancel()
if self.Track_state == 'init':
cv.namedWindow(self.windows_name, cv.WINDOW_AUTOSIZE)
cv.setMouseCallback(self.windows_name, self.onMouse, 0)
if self.select_flags == True:
cv.line(rgb_img, self.cols, self.rows, (255, 0, 0), 2)
cv.rectangle(rgb_img, self.cols, self.rows, (0, 255, 0), 2)
if self.Roi_init[0] != self.Roi_init[2] and self.Roi_init[1] !=
self.Roi_init[3]:
rgb_img, self.hsv_range = self.color.Roi_hsv(rgb_img,
self.Roi_init)
self.gTracker_state = True
self.dyn_update = True
else: self.Track_state = 'init'
#Calculate the value of the center coordinates, self.circle stores the xy value
rgb_img, binary, self.circle = self.color.object_follow(rgb_img, self.hsv_range)
#Publish the message of the center coordinates
threading.Thread(target=self.execute, args=(self.circle[0], self.circle[1],
self.circle[2])).start()
def execute(self, x, y, z):
position = Position()
position.anglex = x * 1.0
position.angley = y * 1.0
position.distance = z * 1.0
self.pub_position.publish(position)
```

3.2.2, colorTracker.py

This program has the following functions: receiving /Current_point and depth image topic data, calculating speed, and then publishing speed data.

```
#Define subscribers to receive required topic data
```

```
self.sub_depth =
self.create_subscription(Image,"/camera/depth/image_raw",self.depth_img_Callback
, 1)
self.sub_position
=self.create_subscription(Position,"/Current_point",self.positionCallback,1)
#Define velocity publisher
self.pub_cmdVel = self.create_publisher(Twist,'/cmd_vel',10)
#Two important callback functions, get self.Center_x value and distance_ value
def positionCallback(self, msg):
def depth_img_Callback(self, msg):
#self.Center_x value and distance_ value are calculated based on linear velocity
and angular velocity
self.execute(self.Center_x, distance_)
def execute(self, point_x, dist):
self.get_param()
if abs(self.prev_dist - dist) > 300:
self.prev_dist = dist
return
if abs(self.prev_angular - point_x) > 300:
self.prev_angular = point_x
return
if self.Joy_active == True: return
linear_x = self.linear_pid.compute(dist, self.minDist)
angular_z = self.angular_pid.compute(320, point_x)
if abs(dist - self.minDist) < 30: linear_x = 0
if abs(point_x - 320.0) < 30: angular_z = 0
twist = Twist()
if angular_z>2.0:
angular_z = 2.0
if angular_z<-2.0:
angular_z = -2.0
if linear_x > 1.0:
linear_x = 1.0
if linear_x <-1.0:
linear_x = -1.0
twist.angular.z = angular_z * 1.0
twist.linear.x = linear_x * 1.0
```