2. Color block positioning experiment

The main purpose of color block positioning is to achieve color block tracking with advanced functions. The principle is to determine the distance and position information of the color block from the camera, and to determine it by calculating the coordinates of the center point of the color block in the camera screen, so as to achieve color block positioning. The experimental results show that it will always find the center point of the color block to follow the movement.

2.1, Main code

Code path: ~/jetcobot_ws/src/jetcobot_color_follow/color_positioning.ipynb

- Import header file

```
import cv2 as cv
import threading
import random
from time import sleep
import ipywidgets as widgets
from IPython.display import display
from positioning import color_follow
```

- Main recognition function, and get the target center point of the color block (color_x, color_y) at the same time

```
def follow_function(self, img, HSV_config):
(color_lower, color_upper) = HSV_config
self.img = cv.resize(img, (640, 480), )
self.img = cv.GaussianBlur(self.img, (5, 5), 0)
hsv = cv.cvtColor(self.img, cv.COLOR_BGR2HSV)
mask = cv.inRange(hsv, color_lower, color_upper)
mask = cv.erode(mask, None, iterations=2)
mask = cv.dilate(mask, None, iterations=2)
mask = cv.GaussianBlur(mask, (5, 5), 0)
cnts = cv.findContours(mask.copy(), cv.RETR_EXTERNAL, cv.CHAIN_APPROX_SIMPLE)[-2]

if len(cnts) > 0:
cnt = max(cnts, key=cv.contourArea)
(color_x, color_y), color_radius = cv.minEnclosingCircle(cnt)

if color_radius > 10:
# Mark the detected color with the prototype coil
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cv.circle(self.img, (int(color_x), int(color_y)), int(color_radius), (255, 0,
255), 3)
print(color_x,color_y)
return self.img
```

- Create widgets

```
button_layout = widgets.Layout(width='200px', height='100px',
align_self='center')
# Output widget Output widget
```

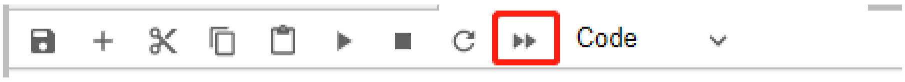
```
output = widgets.Output()
# Color tracking Color tracking
color_follow = widgets.Button(description='color_follow', button_style='success',
layout=button_layout)
# Select color Select color
choose_color = widgets.ToggleButtons(options=['red', 'green', 'blue', 'yellow'],
button_style='success',
tooltips=['Description of slow', 'Description of regular', 'Description of
fast'])
# Cancel tracking Cancel tracking
follow_cancel = widgets.Button(description='follow_cancel',
button_style='danger', layout=button_layout)

# exit exit
exit_button = widgets.Button(description='Exit', button_style='danger',
layout=button_layout)
# Image widget Image widget
imgbox = widgets.Image(format='jpg', height=480, width=640,
layout=widgets.Layout(align_self='auto'))
# Vertical layout Vertical layout
img_box = widgets.VBox([imgbox, choose_color],
layout=widgets.Layout(align_self='auto'))
# Vertical layout Vertical layout
Slider_box = widgets.VBox([color_follow,follow_cancel,exit_button],
layout=widgets.Layout(align_self='auto'))
# Horizontal layout Horizontal layout
controls_box = widgets.HBox([img_box, Slider_box],
layout=widgets.Layout(align_self='auto'))
# ['auto', 'flex-start', 'flex-end', 'center', 'baseline', 'stretch', 'inherit',
'initial', 'unset']
```

Main process:

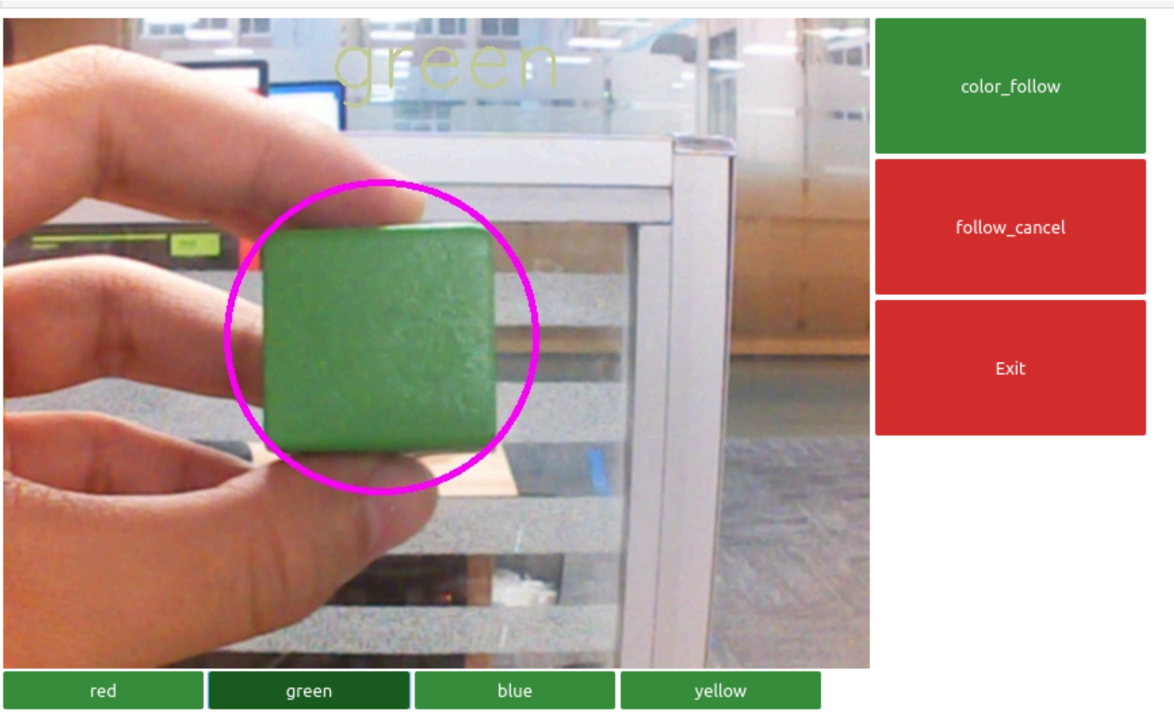
```
def camera():

    global HSV_learning,model
    # 打开摄像头 Open camera
    capture = cv.VideoCapture(0)
    capture.set(3, 640)
    capture.set(4, 480)
    capture.set(5, 30)
    # Be executed in loop when the camera is opened normally
    # 当摄像头正常打开的情况下循环执行
    while capture.isOpened():
        try:
            _, img = capture.read()
            img = cv.resize(img, (640, 480))

            if model == 'color_follow':
                img = follow.follow_function(img, color_hsv[choose_color.value])
                cv.putText(img, choose_color.value, (int(img.shape[0] / 2), 50),
cv.FONT_HERSHEY_SIMPLEX, 2, color[random.randint(0, 254)], 2)

            if model == 'learning_color':
                img,HSV_learning = follow.get_hsv(img)
            if model == 'Exit':
                cv.destroyAllWindows()
                capture.release()
                break
            imgbox.value = cv.imencode('.jpg', img)[1].tobytes()
        except KeyboardInterrupt:capture.release()
```

2.2, Run the program

Click the Run the entire program button on the jupyterlab toolbar, and then pull it to the bottom.



You can see the camera screen, click [color_follow], and you can see that it will follow the center coordinates of the color block to select.


green
color_follow
follow_cancel
Exit
red
green
blue
yellow