Color block positioning

The function of color block positioning is to detect the position of the color block by judging the HSV value of the camera image, frame the color block, and print the position coordinates of the color block.

1. Main code

Code path:

```
~/dofbot_ws/src/dofbot_color_follow/scripts/Color_position.ipynb
```

- Import header file

```
import cv2 as cv
import threading
import random
import ipywidgets as widgets
from IPython.display import display
from color_position import Color_Position
from dofbot_utils.robot_controller import Robot_Controller
from dofbot_utils.fps import FPS
from dofbot_utils.dofbot_config import *
```

- The main recognition function, which simultaneously obtains the target center point of the color block (color_x, color_y)

```
def process(self, img, HSV_config):
        (color_lower, color_upper) = HSV_config
        # self.img = cv.resize(img, (640, 480), )
        self.img = img.copy()
        img1 = cv.GaussianBlur(self.img, (5, 5), 0)
        hsv = cv.cvtColor(img1, 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]
        pos = None
        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
                # 将检测到的颜色用原形线圈标记出来
                cv.circle(self.img, (int(color_x), int(color_y)),
int(color_radius), (255, 0, 255), 3)
                pos = (int(color_x), int(color_y))
```

```
        return self.img, pos
```

- Creating Controls

```
button_layout = widgets.Layout(width='200px', height='100px',
align_self='center')
# 输出控件 Output widget
output = widgets.Output()
# 颜色定位 Color position
color_position = widgets.Button(description='color_position',
button_style='success', layout=button_layout)
# 选择颜色 Select color
choose_color = widgets.ToggleButtons(options=['red', 'green', 'blue', 'yellow'],
button_style='success',
             tooltips=['Description of slow', 'Description of regular',
'Description of fast'])
# 取消追踪 Cancel tracking
position_cancel = widgets.Button(description='position_cancel',
button_style='danger', layout=button_layout)

# 退出 exit
exit_button = widgets.Button(description='Exit', button_style='danger',
layout=button_layout)
# 图像控件 Image widget
imgbox = widgets.Image(format='jpg', height=480, width=640,
layout=widgets.Layout(align_self='auto'))
# 垂直布局 Vertical layout
img_box = widgets.VBox([imgbox, choose_color],
layout=widgets.Layout(align_self='auto'))
# 垂直布局 Vertical layout
Slider_box = widgets.VBox([color_position,position_cancel,exit_button],
                          layout=widgets.Layout(align_self='auto'))
# 水平布局 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:

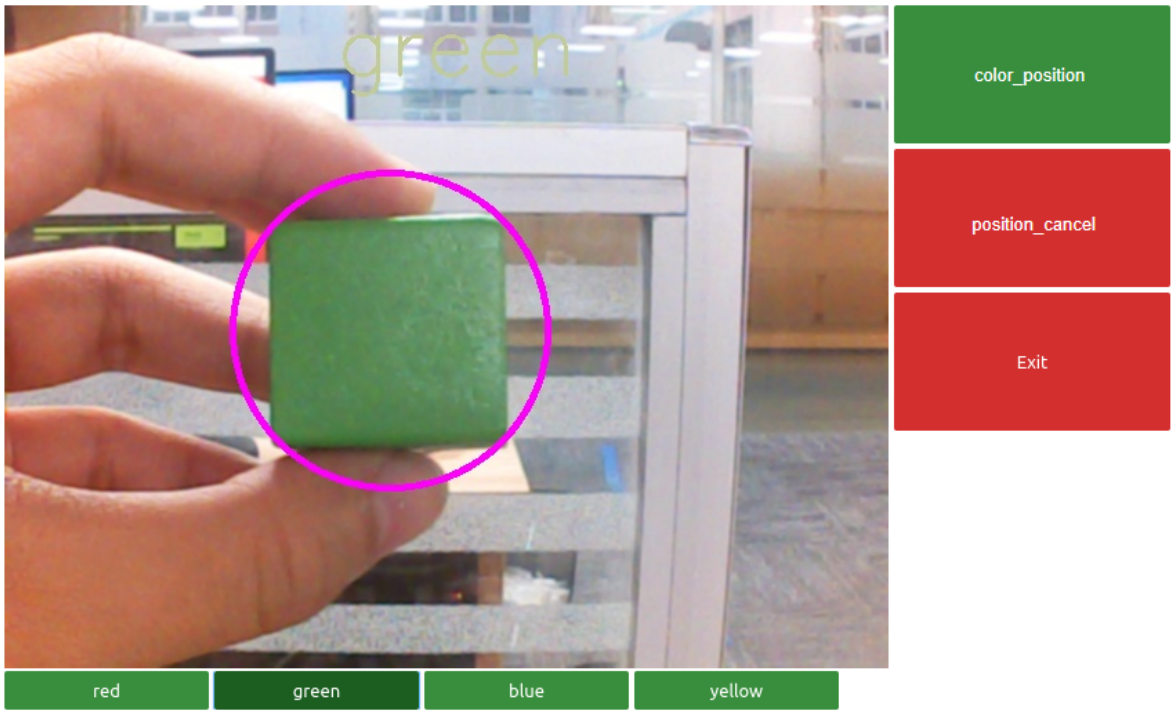
```
def camera():
    global model
    # 打开摄像头 Open camera
    capture = cv.VideoCapture(0)
    capture.set(3, 640)
    capture.set(4, 480)
    capture.set(5, 30)
    # Be executed in loop when the camera is opened normally
    # 当摄像头正常打开的情况下循环执行
    while capture.isOpened():
        try:
          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

```
                img, pos = position.process(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 pos is not None:
                    print("x={}, y={}".format(pos[0], pos[1]))
            if model == 'Exit':
                cv.destroyAllWindows()
                capture.release()
                break
            fps.show_fps(img)
            imgbox.value = cv.imencode('.jpg', img)[1].tobytes()
        except:capture.release()
```

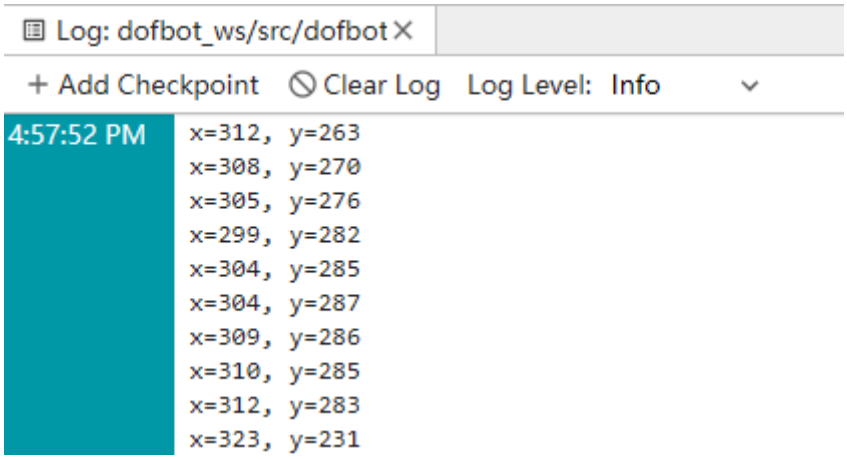
2. Run the program

Click the Run Entire Program button on the Jupyterlab toolbar, and then pull it to the bottom.

You can see the camera screen, click [color_position], select the color to be located, for example, select [green] here, you can see that the green square has been framed.



Open the Log information, select Log Level as Info, and you can see the position coordinates of the printed color block.



If you need to turn off the function, please click the [position_cancel] button.

If you need to end the program, please click [Exit] to avoid affecting other programs calling resources.

Note: If the color recognition is not accurate, you can use ~/dofbot_ws/src/dofbot_color_follow/scripts/HSV_calibration.ipynb file to calibrate the color.