Identify grab color block

1. Functional introduction

The color recognition grab block function mainly detects the HSV value of the color in the image box, distinguishes the color of the current block according to the HSV value, and then the robot arm rotates to the position of the corresponding color on the map to grab the block and put it in the middle cross position.

Note: Before starting the program, please follow the [Assembly and Assembly Tutorial] -> [Install Map] tutorial, and operate after the map is correctly installed.

Code path:

```
~/dofbot_ws/src/dofbot_color_grab/scripts/Color_Grab.ipynb
```

2. Code block design

- Import header file

```python
import cv2 as cv
import threading
import ipywidgets as widgets
from IPython.display import display
from color_grab import Color_Grab
from dofbot_utils.fps import FPS
from dofbot_utils.robot_controller import Robot_Controller
```

- Create an instance and initialize parameters

```python
grab = Color_Grab()
robot = Robot_Controller()
robot.move_look_front()

fps = FPS()
model = 'Start'
```

- Creating Controls

```
# 创建控件布局  Create widget layout
button_layout  = widgets.Layout(width='200px', height='70px',
align_self='center')
# 输出打印  Output printing
output = widgets.Output()
# 退出按钮  exit button
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='center'))
# 垂直放置  Vertical placement
controls_box = widgets.VBox([imgbox, exit_button],
layout=widgets.Layout(align_self='center'))
# ['auto', 'flex-start', 'flex-end', 'center', 'baseline', 'stretch', 'inherit',
'initial', 'unset']
```

- Switching Mode

```
def exit_button_Callback(value):
    global model
    model = 'Exit'
#     with output: print(model)
exit_button.on_click(exit_button_Callback)
```

- Main Program

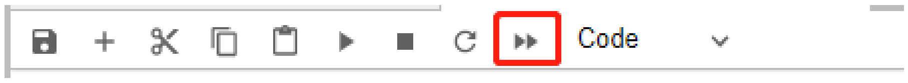
```
def camera():
    # 打开摄像头 Open camera
    capture = cv.VideoCapture(0)
    capture.set(cv.CAP_PROP_FRAME_WIDTH, 640)
    capture.set(cv.CAP_PROP_FRAME_HEIGHT, 480)
    while capture.isOpened():
        try:
            if model == 'Exit':
                capture.release()
                break
            _, img = capture.read()
            fps.update_fps()
            # 获得运动信息  Get motion information
            img = grab.start_grab(img)
            fps.show_fps(img)
            imgbox.value = cv.imencode('.jpg', img)[1].tobytes()
        except KeyboardInterrupt:capture.release()
        except Exception as e:
            print(e)
```

- start up

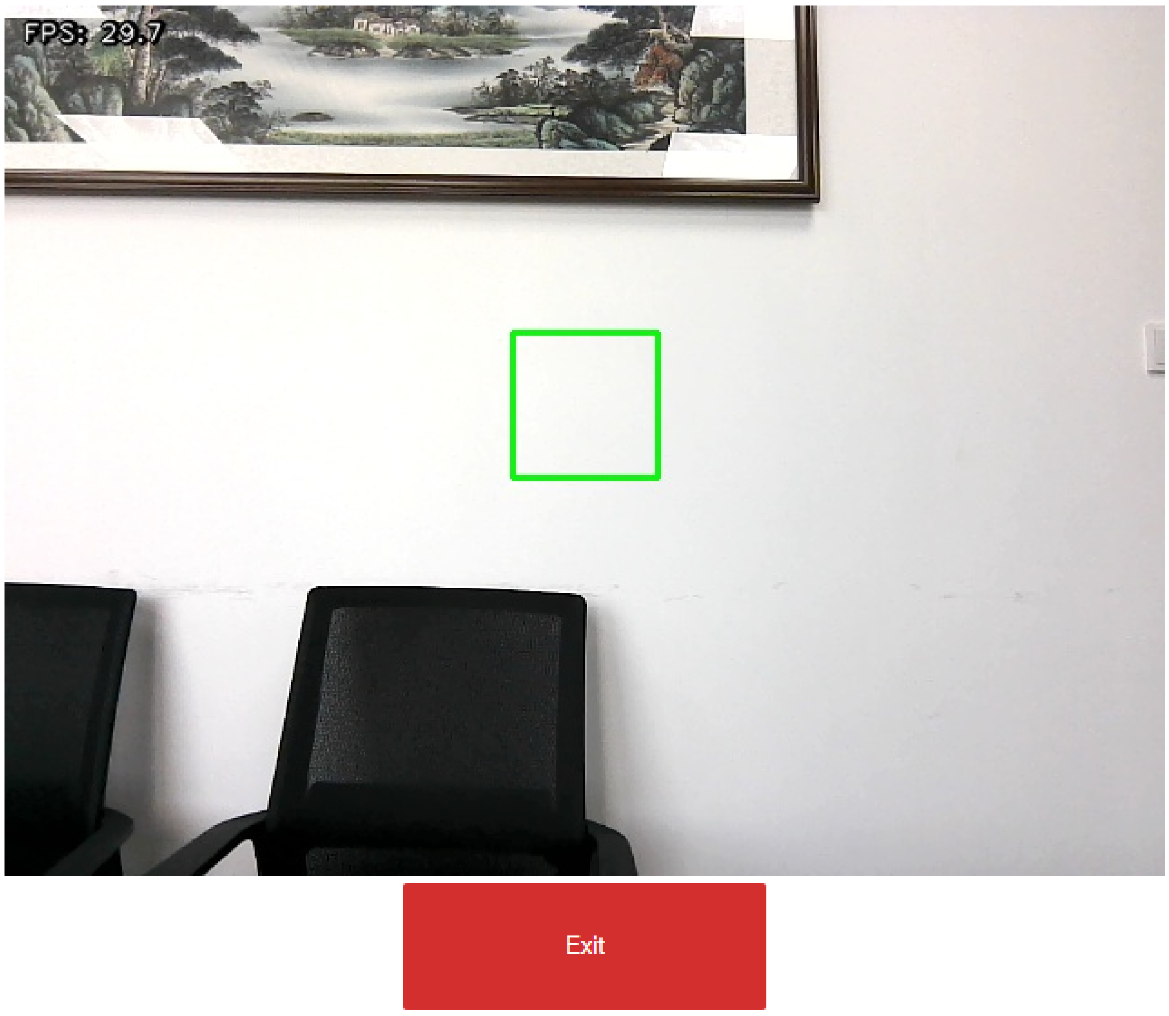
```
display(controls_box,output)
threading.Thread(target=camera, ).start()
```

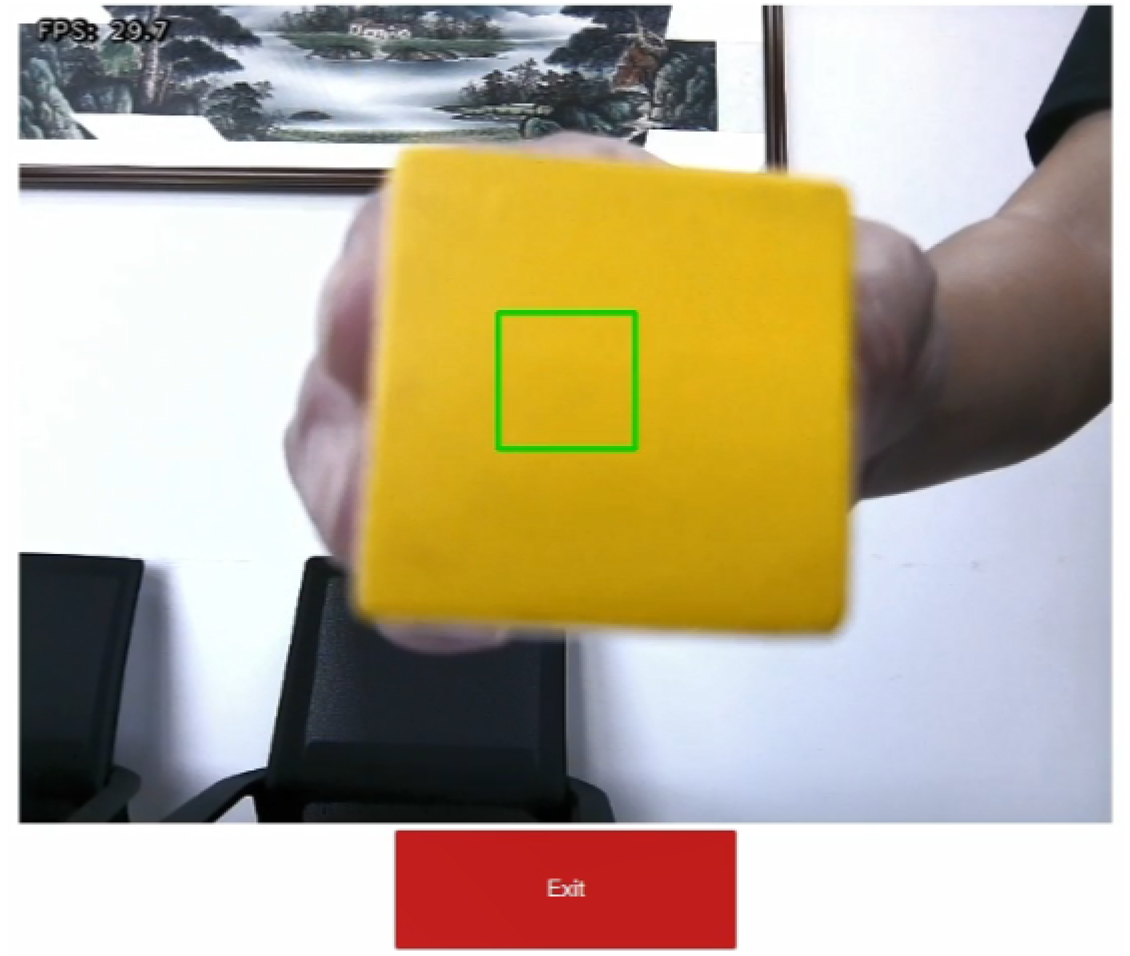
3. Run the program

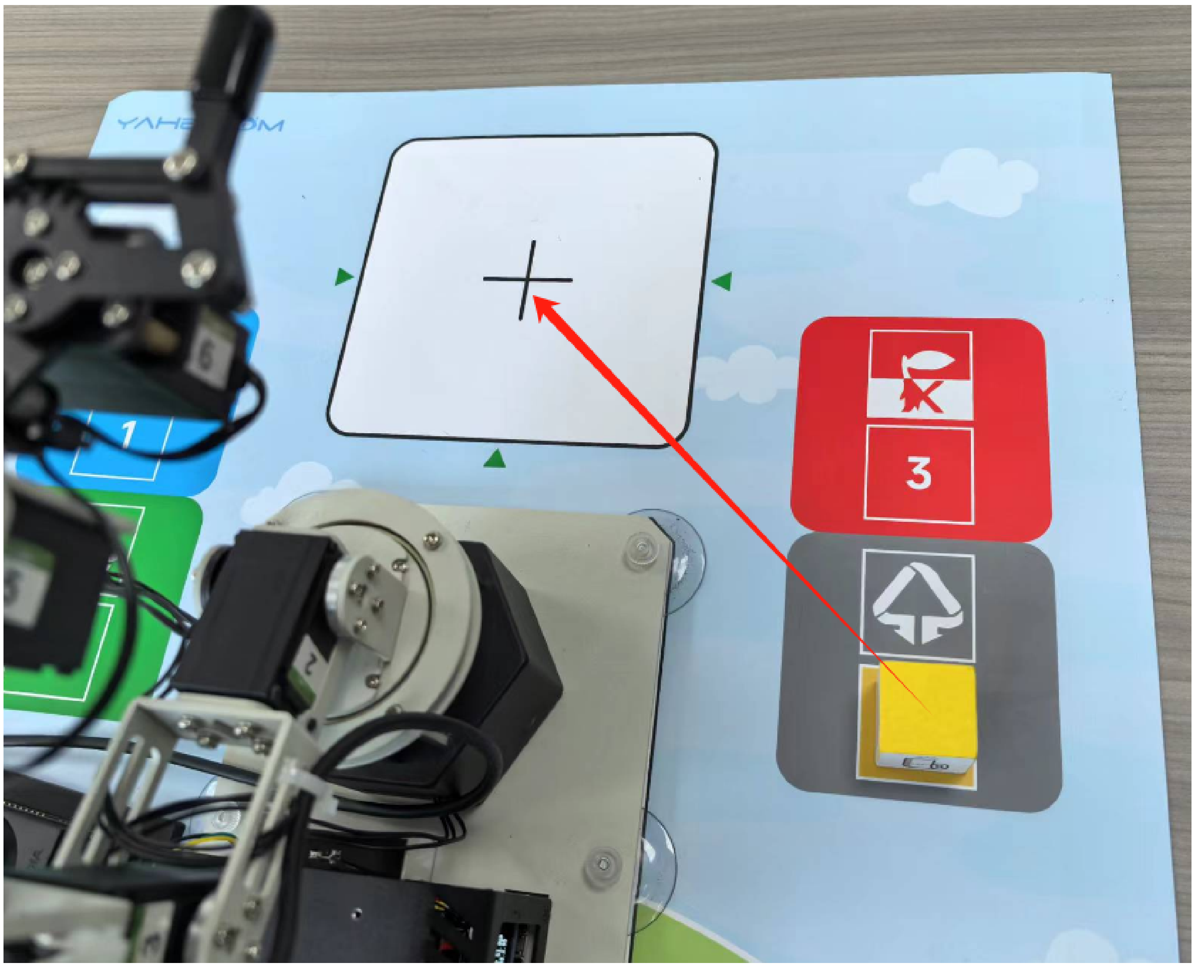
Click the Run the entire program button on the jupyterlab toolbar, and then pull it to the bottom.

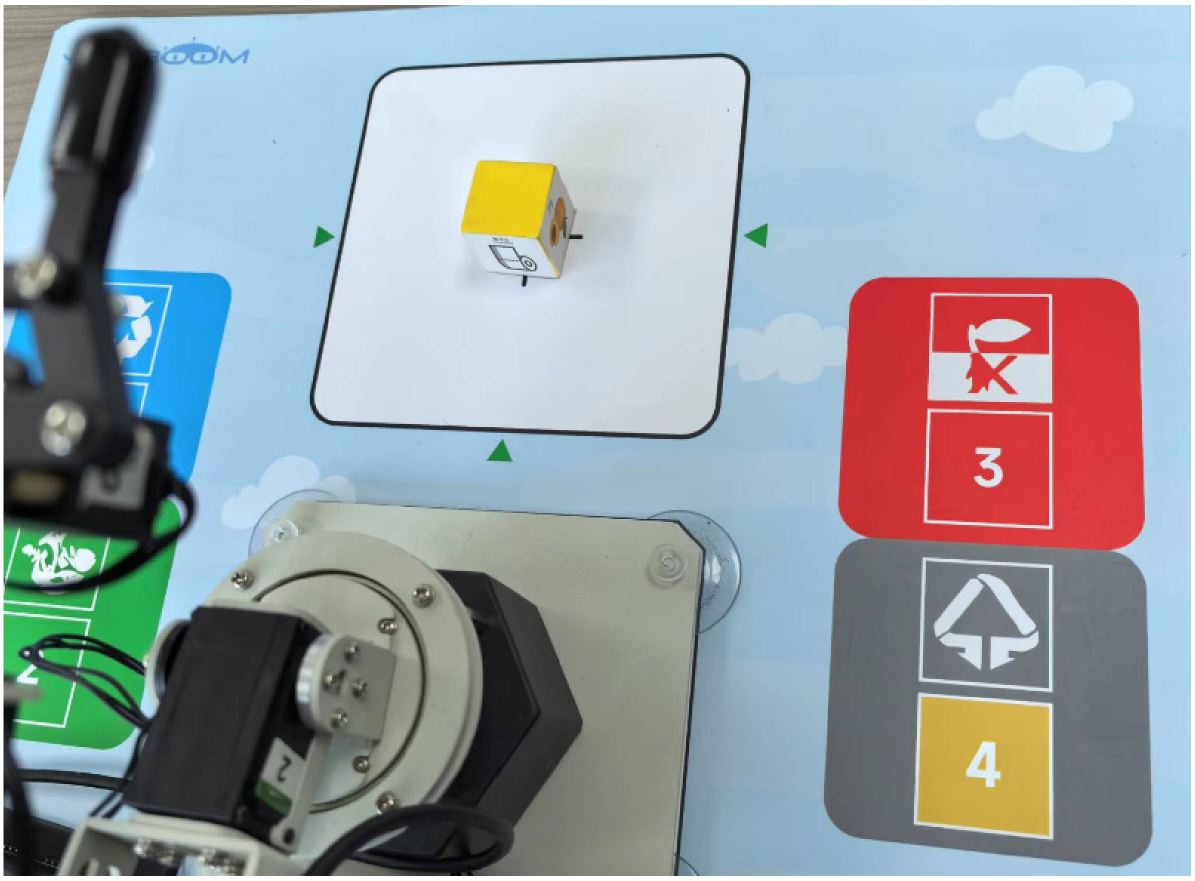


You can see a green box in the middle of the camera screen. Put the color building block to be clamped into the box, wait for the recognition to be completed, the buzzer will sound, and then put the building block into the corresponding color area. The robot arm will automatically go to the corresponding color area to grab the building block and put it on the cross in the middle.




FPS: 29.7
Exit


YAHBOOM
1
3



Before starting the next recognition and capture, please remove the building blocks on the cross.

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