# Identify gesture grab color block

1. Gesture recognition instructions

The gesture recognition to grab blocks function mainly combines the mediapipe gesture recognition function, the robot arm and the map gameplay. A total of five gestures are recognized, gestures 1-5, where gestures 1-4 represent the gripping positions 1-4 on the map, and put the blocks on the cross, and gesture 5 performs the rotation of the gripper.

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

2. Experimental placement

Place the blocks at the positions numbered 1-4.
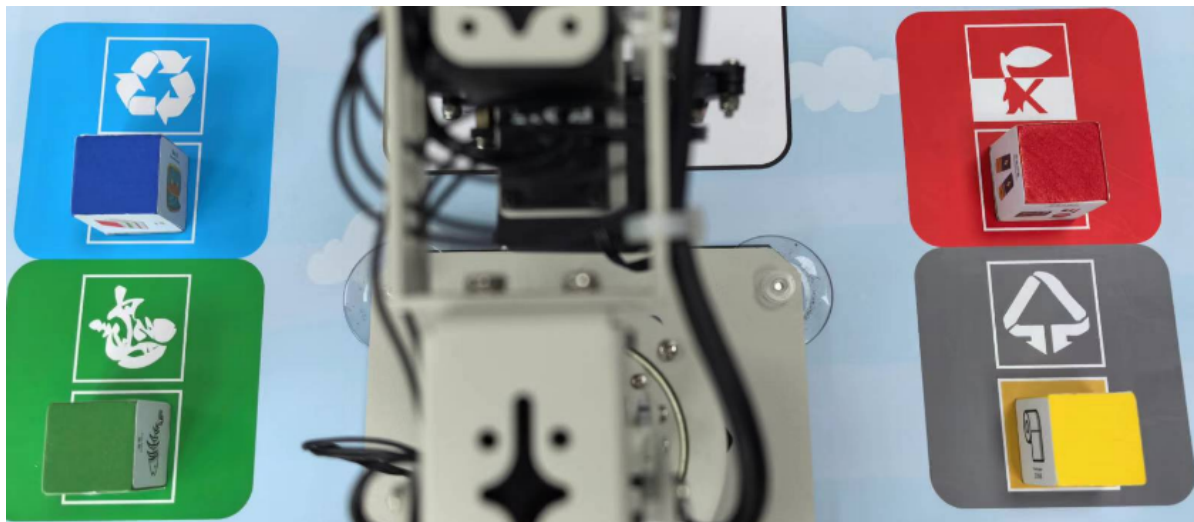
3. Code block design

- Import header file

```
import cv2 as cv
import threading
import time
import ipywidgets as widgets
from IPython.display import display
from gesture_grasp import Gesture_Grasp
from dofbot_utils.fps import FPS
from dofbot_utils.robot_controller import Robot_Controller
```

- Create an instance and initialize parameters

```
robot = Robot_Controller()
robot.move_init_pose()
fps = FPS()

gesture = Gesture_Grasp()
model = 'General'
```

- Create controls

```
def exit_button_Callback(value):
    global model
    model = 'Exit'
    with output:
        print(model)

exit_button.on_click(exit_button_Callback)
```

- Switch Mode

```
def target_detection_Callback(value):
    global model,debug_pos
    model = 'Detection'
    with output: print(model)
    debug_pos = True
def grap_Callback(value):
    global model
    model = 'Grap'
    with output: print(model)
def exit_button_Callback(value):
    global model
    model = 'Exit'
    with output: print(model)
target_detection.on_click(target_detection_Callback)
grap.on_click(grap_Callback)
exit_button.on_click(exit_button_Callback)
```

- Main program

```
def camera():
    global model, gesture
    # 打开摄像头 Open camera
    capture = cv.VideoCapture(0)
    capture.set(3, 640)
    capture.set(4, 480)
    # 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()
            gesture.process(img)
            if model == 'Exit':
                capture.release()
```

```
            del gesture
            break
        fps.show_fps(img)
        imgbox.value = cv.imencode('.jpg', img)[1].tobytes()
        time.sleep(0.001)
    except Exception as e:
        print("program end")
        print(e)
        capture.release()
```

- Start up

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

4. Start the program

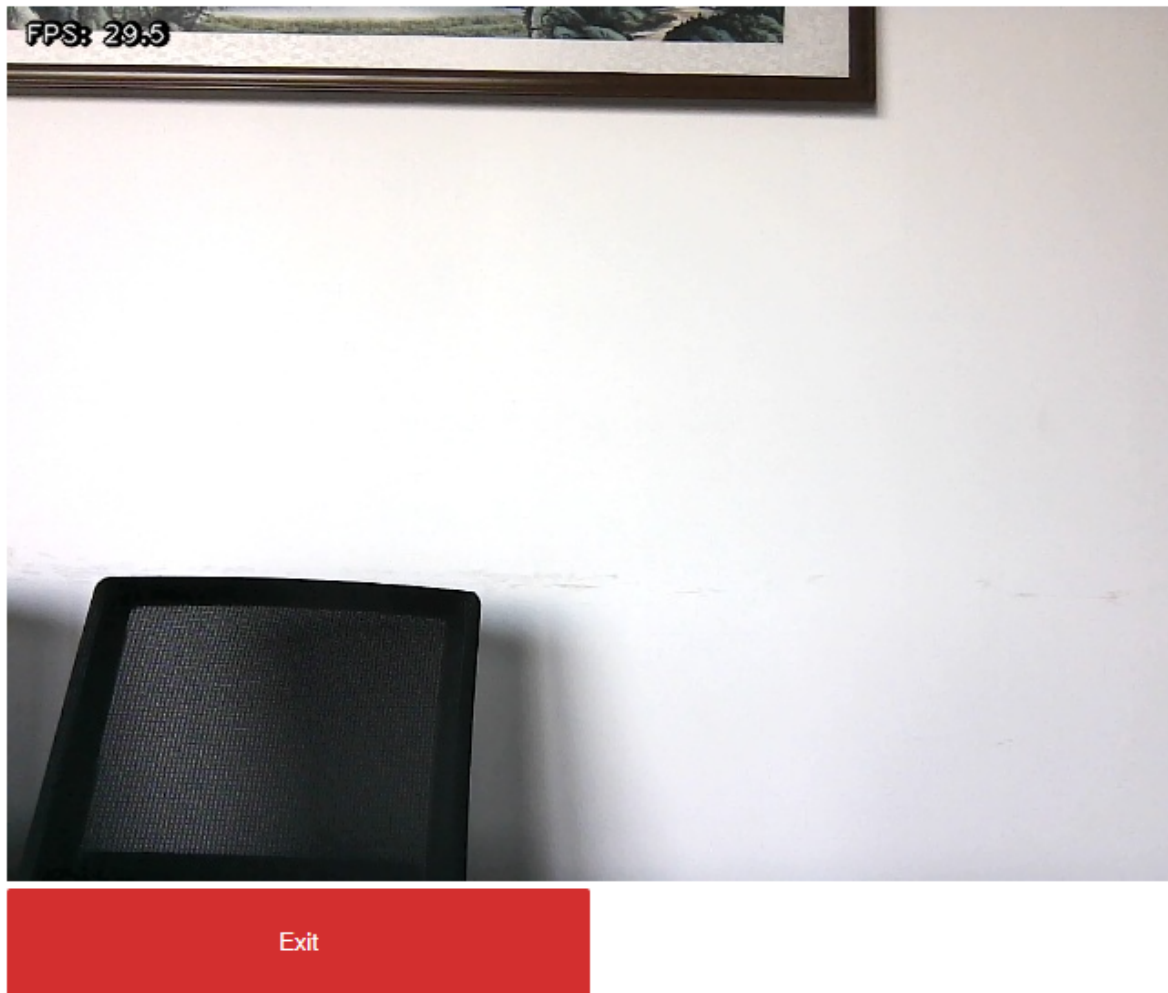Open the jupyterlab webpage and find the corresponding .ipynb program file.

Code path:

```
~/dofbot_ws/src/dofbot_gesture/scripts/Gesture_Grasp.ipynb
```

Then click Run all commands.

5. Experimental effect

After the program runs, slide to the bottom, and the jupyterlab webpage will display the camera screen and the functions of the related buttons.
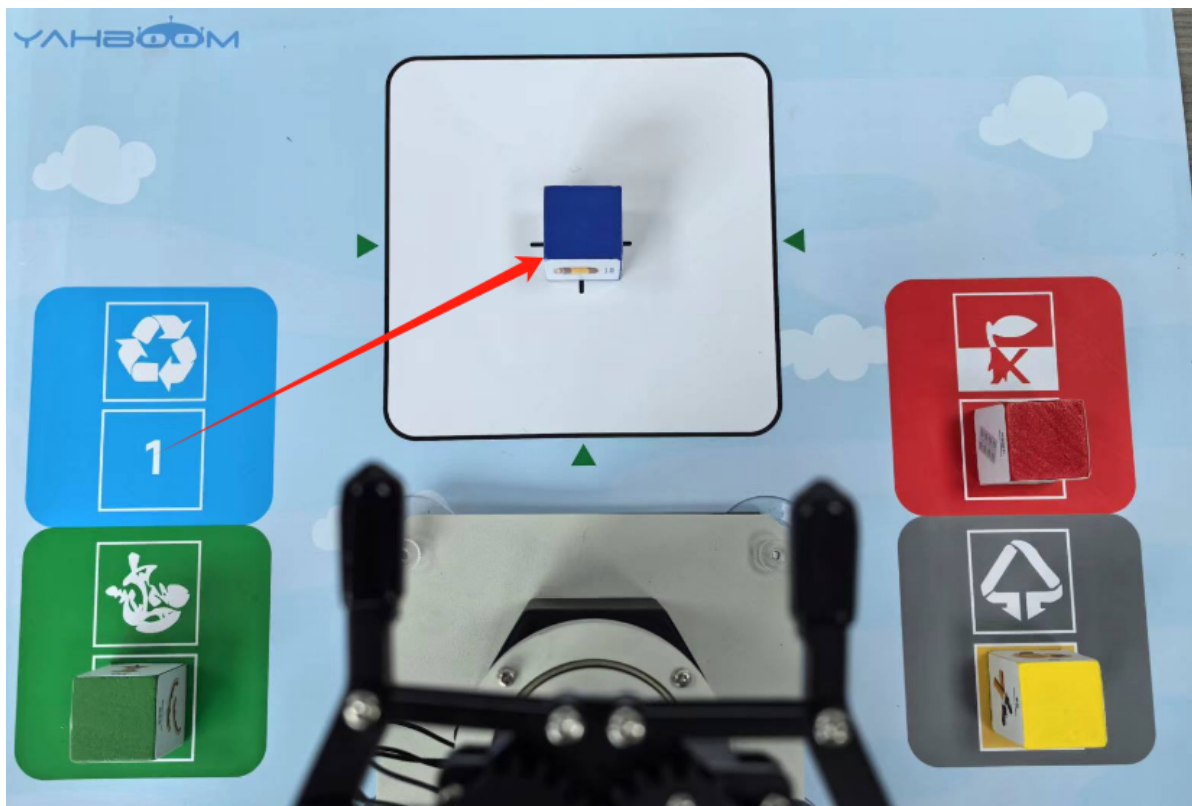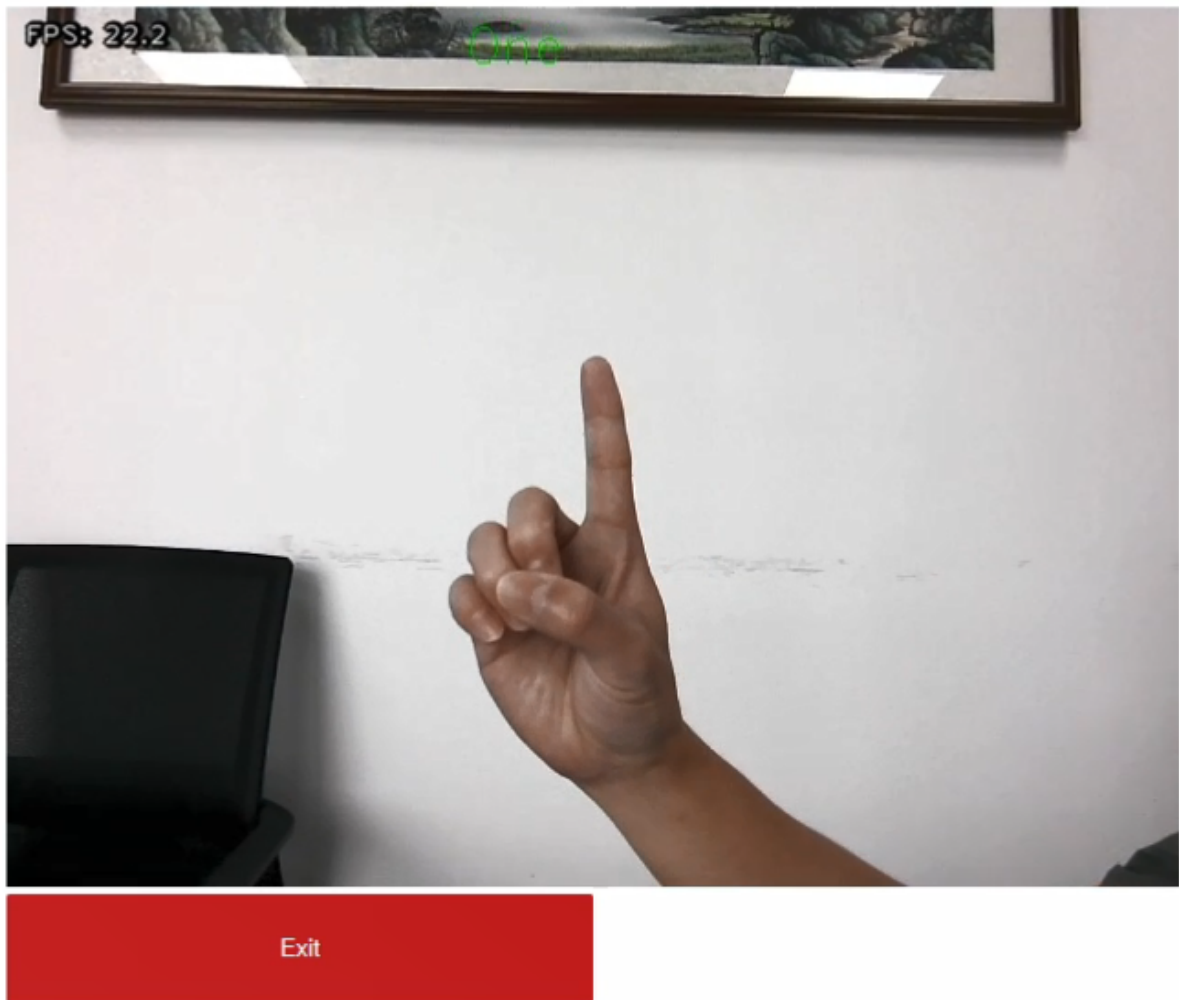
Exit

If the set gesture action is recognized, the robot arm will perform the corresponding action. When the robot arm recognizes gesture 1, it will go to the position of gesture 1 to grab the building block and put it on the middle cross. After placement, you need to move the blocks on the cross to avoid the next placement conflict. When the robot arm recognizes gesture 2, gesture 3, and gesture 4, it goes to the corresponding position to pick up the blocks and put them on the cross. When the robot arm recognizes gesture 5, it rotates the robot arm gripper.

 The gestures and actions in this example correspond to the following:

Gesture	Function
Gesture 1	Pick up the blocks at position 1 and put them in the middle cross position
Gesture 2	Pick up the blocks at position 2 and put them in the middle cross position
Gesture 3	Pick up the blocks at position 3 and put them in the middle cross position
Gesture 4	Pick up the blocks at position 4 and put them in the middle cross position
Gesture 5	Rotate the robot arm gripper

As shown in the figure below:

If there are blocks on the center cross, please remove the blocks on the cross before starting to recognize gestures.

If you need to exit the program, please click the [Exit] button.