Tag code tracking experiment

1. Functional introduction

Based on the tag code positioning function, the tag code tracking function is realized in combination with the robotic arm.

Code path:

```
~/dofbot_pro/dofbot_apriltag/scripts/Apriltag_Follow.ipynb
```

2. Code block design

- Import header files

```
import cv2 as cv
import threading
import random
from time import sleep
import ipywidgets as widgets
from IPython.display import display
from apriltag_identify import ApriltagIdentify
from apriltag_follow import Apriltag_Follow
from dofbot_utils.fps import FPS
from dofbot_utils.robot_controller import Robot_Controller
```

- Create an instance and initialize parameters

```
apriltag_Identify = ApriltagIdentify()
follow = Apriltag_Follow()
model = 'General'

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

- Create controls

```
button_layout      = widgets.Layout(width='320px', height='60px',
align_self='center')
output = widgets.Output()

# 开始追踪 Start tracking
start_button = widgets.Button(description='Start', button_style='success',
layout=button_layout)
# 取消追踪 Cancel tracking
cancel_button = widgets.Button(description='Cancel', button_style='danger',
layout=button_layout)
# 退出 exit
exit_button = widgets.Button(description='Exit', button_style='danger',
layout=button_layout)
```

```
box_button = widgets.VBox([start_button, cancel_button, exit_button],
layout=widgets.Layout(align_self='center'))
# 图像控件 Image widget
imgbox = widgets.Image(format='jpg', height=480, width=640)
# 垂直布局 Vertical layout
display_box = widgets.HBox([imgbox, box_button])
```

- Switch mode

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

def start_button_Callback(value):
    global model
    model = 'Start'

def cancel_button_Callback(value):
    global model
    model = 'General'

exit_button.on_click(exit_button_Callback)
start_button.on_click(start_button_Callback)
cancel_button.on_click(cancel_button_Callback)
```

- Main program

```
def camera():

    global model
    # 打开摄像头 Open camera
    capture = cv.VideoCapture(0, cv.CAP_V4L2)
    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.convertScaleAbs(img, beta=35)
            fps.update_fps()
            img, msg = apriltag_Identify.getApriltagPosition(img)
            # if len(msg):
            #     print(msg)
            if model == 'Start':
                follow.follow_function(msg)
            if model == 'Exit':
                capture.release()
                break
            fps.show_fps(img)
            imgbox.value = cv.imencode('.jpg', img)[1].tobytes()
        except Exception as e:
            print("program end")
```

```
            print(e)
            capture.release()
```

- Start

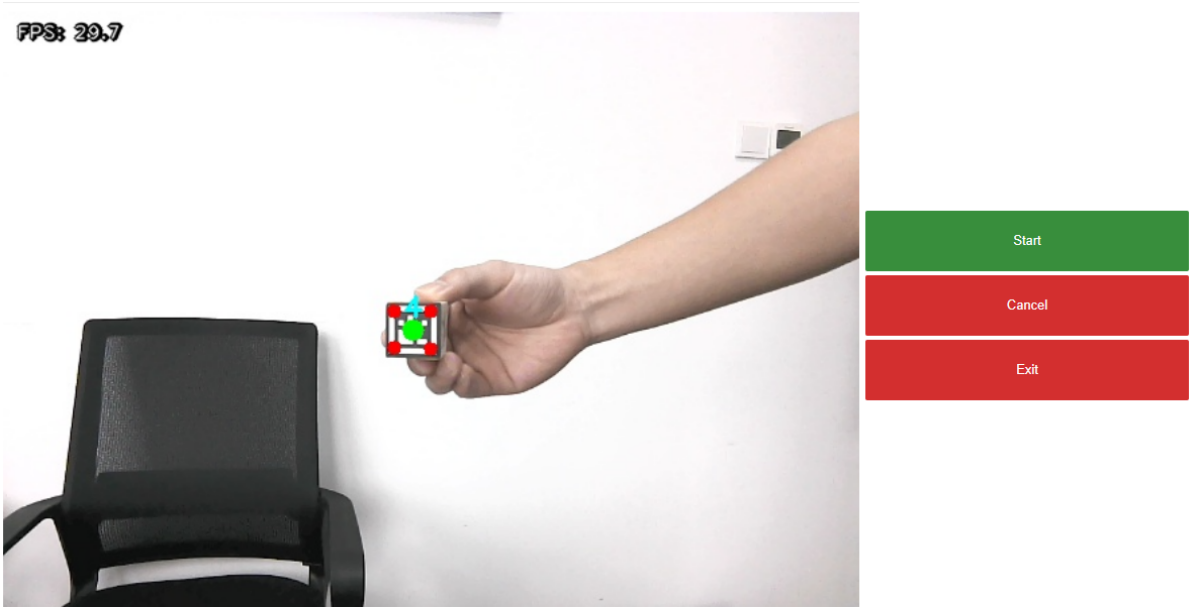
```
display(controls_box,output)
threading.Thread(target=camera, ).start()
```

3. 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. At this time, click the [Start] button to turn on the tracking function. Put the label code block into the camera screen. You can see the correct positioning of the label code and the ID number written on the label code. Move the label code and the robot arm will move with the label code.

Note that the speed of moving the label code should not be too fast, otherwise the robot arm may not be able to keep up because of the fast movement.



If you want to stop tracking, please click the [Cancel] button.

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