Object recognition

By calling yolov4-tiny through opencv for object recognition detection, most object names can be recognized.

1. Code path

Code path:

```
~/dofbot_ws/src/dofbot_basic_visual/scripts/06.Object_Recognition/06.Object_Reco
gnition.ipynb
```

2. File configuration

First, we need to import the yolov4-tiny network model structure cfg file, network weights file, and the txt file of the classification name of the COCO dataset. (Here we directly use the yolo4 official dataset and model)

3. Target detection

3.1 Build model network structure

First, use the **cv2.dnn.readNet()** function to construct the CSPDarknet53 network structure, pass in the model structure cfg file, and the network weights file. Opencv provides several methods for supporting image classification, detection, and segmentation for neural network modules, automatically implementing pre-processing and post-processing of input images. Here, the target detection module **cv2.dnn_DetectionModel()** is used to pass in the network model.

```
self.net = cv2.dnn.readNet('yolov4-tiny.cfg', 'yolov4-tiny.weights')
self.model = cv2.dnn_DetectionModel(self.net)
```

3.2 Target detection method

```
classids, scores, bboxes = self.model.detect(image, confThreshold,
numsThreshold)
```

Parameters:

frame: Input image

confThreshold: Confidence threshold used to filter the selection box, minimum confidence for target detection

numsThreshold: Custom threshold in non-maximum suppression

Return value:

classIds: Category index

confidences: Confidence, the probability that the detection box belongs to a certain category

boxes: Detection box information, upper left corner coordinates (x, y), box width and height (w, h)

3.3 Set model input parameters

```
self.model.setInputParams(size=(320,320), scale=1/255)
```

size means scaling the input image to the specified size. The larger the size, the better the detection effect, but the slower the detection speed. **scale** means the scaling size of the pixel value.

4. Main code

Import various libraries and model files

```
#!/usr/bin/env python
# coding: utf-8
import Arm_Lib
import cv2 as cv
import threading
from time import sleep
import ipywidgets as widgets
from IPython.display import display
from Object_recognition import Object_recognition_identify
```

Object recognition function

```
def detect_image(self, image):

        classids, scores, bboxes = self.model.detect(image, 0.5, 0.3)

        for class_id, self.score, bbox in zip(classids, scores, bboxes):
            self.x, self.y, self.w, self.h = bbox
            self.class_name = self.classes[class_id]

        cv2.rectangle(image, (self.x,self.y), (self.x+self.w,self.y+self.h), 
(255,255,0), 2)

        cv2.putText(image, self.class_name, (self.x,self.y+self.h+20), 
cv2.FONT_HERSHEY_COMPLEX, 1, (0,255,0), 2)

        cv2.putText(image, str(int(self.score*100))+'%', (self.x,self.y-5), 
cv2.FONT_HERSHEY_COMPLEX, 1, (0,255,255), 2)

        return image
```

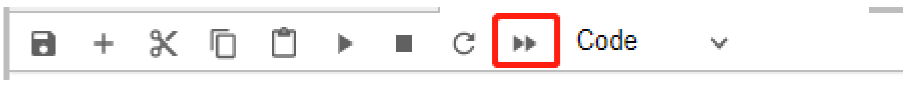
Object name list:

```
person
bicycle
car
motorbike
aeroplane
bus
train
truck
boat
traffic light
fire hydrant
stop sign
parking meter
bench
bird
cat
dog
horse
sheep
cow
elephant
bear
zebra
giraffe
backpack
umbrella
handbag
tie
suitcase
frisbee
skis
snowboard
sports ball
kite
baseball bat
baseball glove
skateboard
surfboard
tennis racket
bottle
wine glass
cup
fork
```

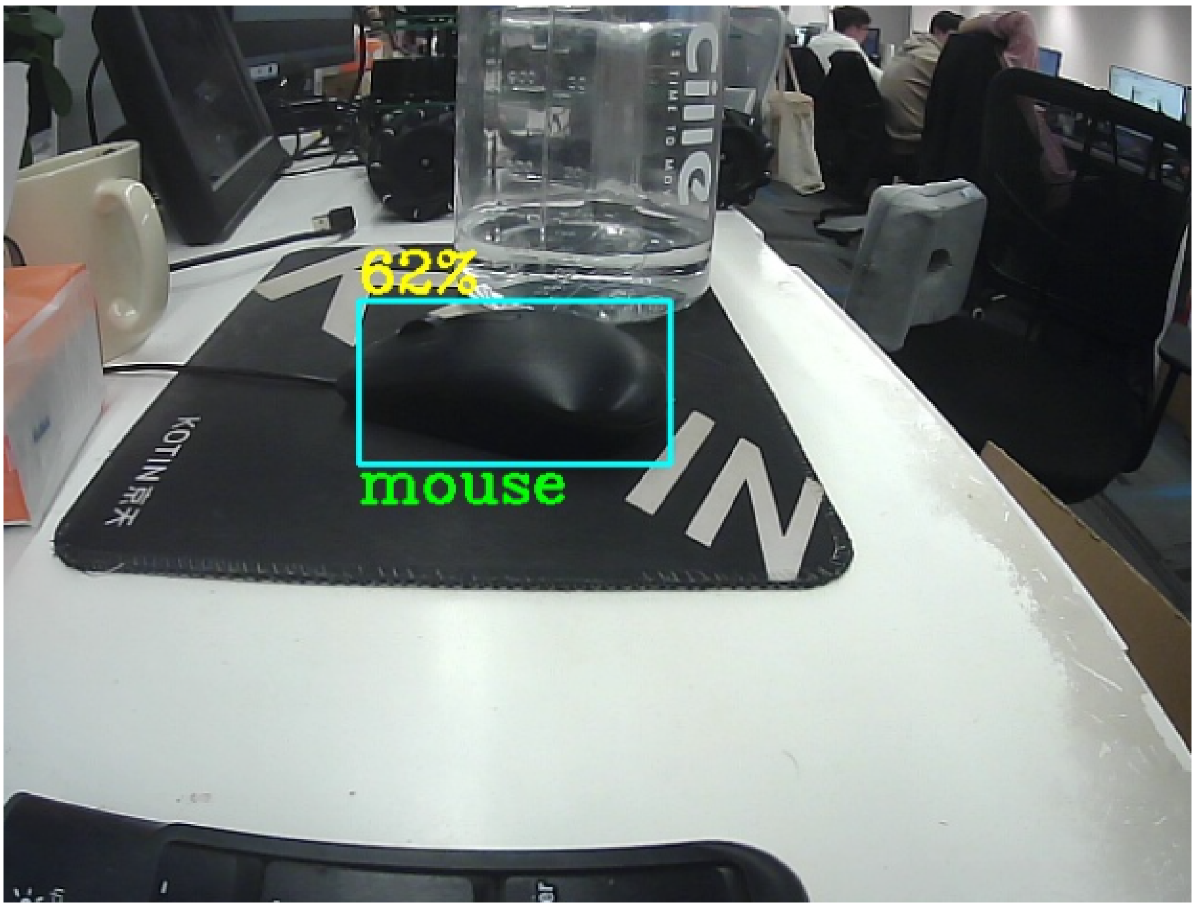
Main thread

```
def camera():
    # 打开摄像头 Open camera
    capture = cv.VideoCapture(0)
    # Loop execution when the camera is opened normally
    while capture.isOpened():
        try:
            _, img = capture.read()
            img = cv.resize(img, (640, 480))
            img = ob_re.detect_image(img)
            if model == 'Exit':
                cv.destroyAllWindows()
                capture.release()
                break
            imgbox.value = cv.imencode('.jpg', img)[1].tobytes()
        except KeyboardInterrupt:capture.release()
```

Program Click the Run Entire Program button on the Jupyterlab toolbar, then scroll to the bottom to see the camera component display.



At this time, put the recognizable object into the camera screen, and the object name can be framed and displayed.



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