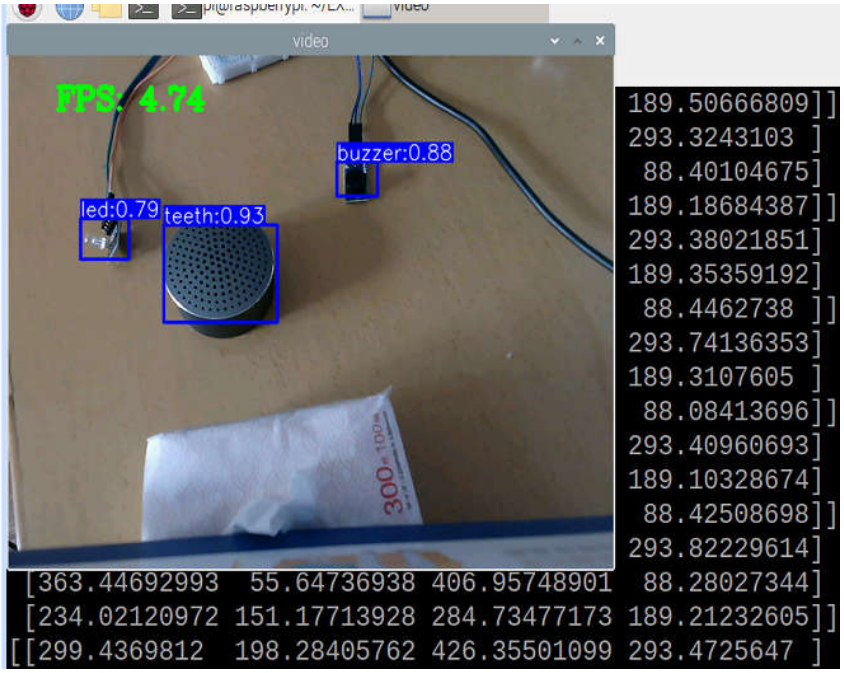
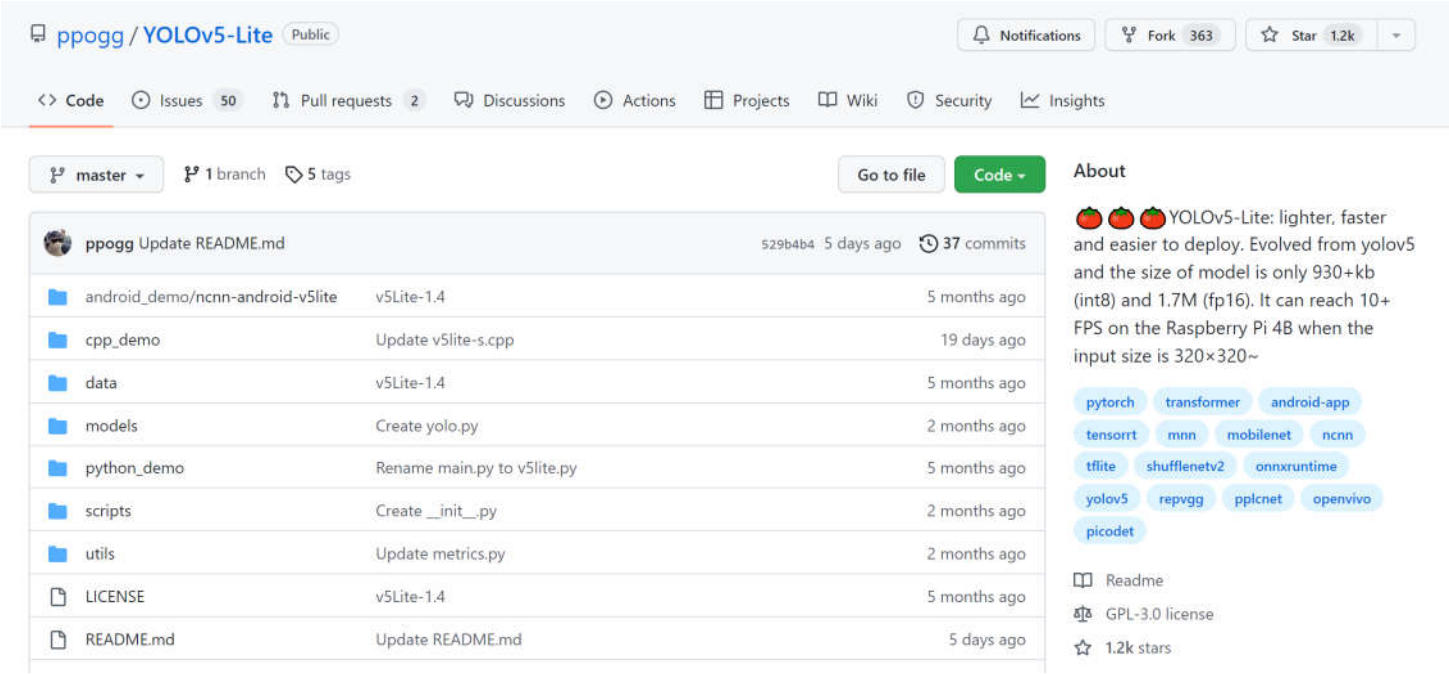
智能系统与控制



树莓派：YOLOV5-Lite 目标检测

于泓
鲁东大学
信息与电气工程学院
2022.7.27

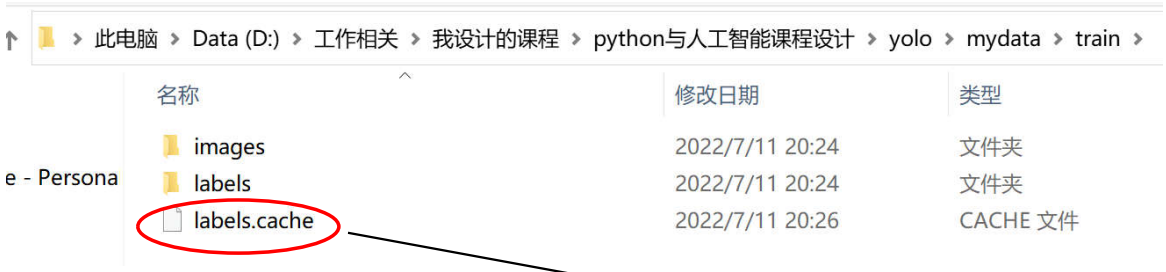
YoloV5-lite https://github.com/ppogg/YOLOv5-Lite



通过改变主干网络的结构生成的轻量型模型

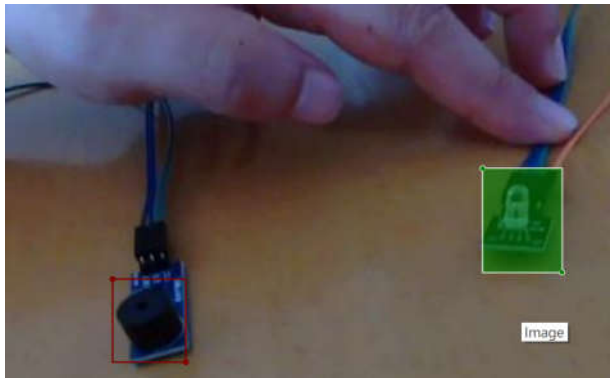
（1） 数据采集 与yolov5相同

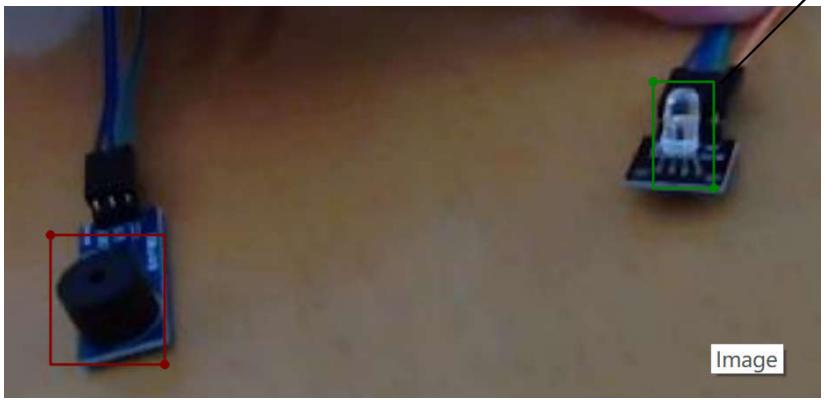
注意：



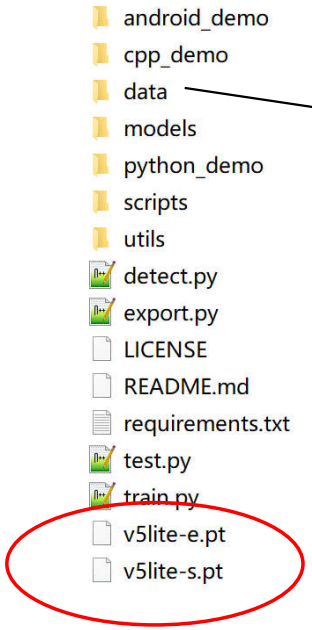
删除

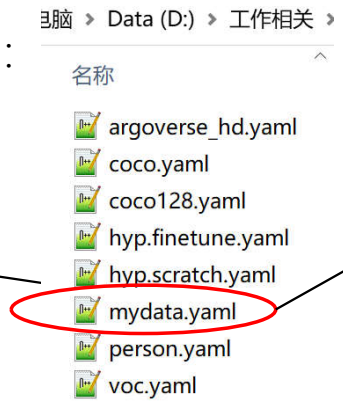
标注时目标尽量的贴合





（2） 预训练模型下载：






```yaml
# train and val data as 1) directory: path/images/, 2) fi
train: ../data_led_buzzer/train/images  # 118287 images
val: ../data_led_buzzer/valid/images  # 5000 images
test:
# number of classes
nc: 3

# class names
names: ['led','buzzer','teeth']
```

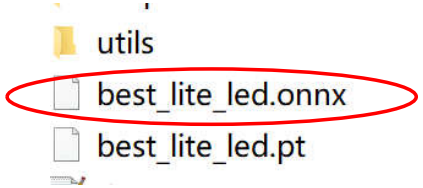
(3) 模型训练

python train.py --weights v5lite-s.pt
--cfg models/v5Lite-s.yaml
--img-size 320
--batch-size 16
--data data/mydata.yaml
--device cpu

结果存放： **run/trian/exp/weights**

(4) 模型导出 生成 onnx文件

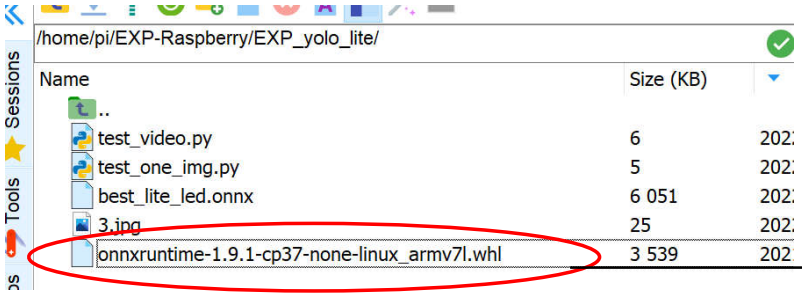
python export.py --weights best_lite_led.pt



把onnx文件下载到树莓派中

(5) 在树莓派中安装 onnxruntim

Numpy版本1.21



pip3 install xxx.whl

模型使用：

```python
import cv2
import numpy as np
import onnxruntime as ort
import math
import time
```

```python
if __name__ == "__main__":

    # 模型加载
    model_pb_path = "best_lite_led.onnx"
    so = ort.SessionOptions()
    net = ort.InferenceSession(model_pb_path, so)

    # 标签字典
    dic_labels= {0:'led',
            1:'buzzer',
            2:'teeth'}

    # 模型参数
    model_h = 320
    model_w = 320
    nl = 3
    na = 3
    stride=[8.,16.,32.]
    anchors = [[10, 13, 16, 30, 33, 23], [30, 61, 62, 45, 59, 119], [116, 90, 156, 198, 373, 326]]
    anchor_grid = np.asarray(anchors, dtype=np.float32).reshape(nl, -1, 2)

    # 进行推理
    img0 = cv2.imread('3.jpg')
    t1 = time.time()
    det_boxes,scores,ids = infer_img(img0,net,model_h,model_w,nl,na,stride,anchor_grid,thred_nms=0.4,thred_cond=0.5)
    t2 = time.time()
    print("%.2f"%(t2-t1))
    # 结果绘图
    for box,score,id in zip(det_boxes,scores,ids):
        label = '%s:%.2f'%(dic_labels[id],score)

        plot_one_box(box.astype(np.int), img0, color=(255,0,0), label=label, line_thickness=None)
    cv2.imshow('img',img0)

    cv2.waitKey(0)
```

三层输出

每层3种锚框

每层缩放尺度

```python
def infer_img(img0,net,model_h,model_w,nl,na,stride,anchor_grid,thred_nms=0.4,thred_cond=0.5):
    # 图像预处理
    img = cv2.resize(img0, [model_w,model_h], interpolation=cv2.INTER_AREA)
    img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
    img = img.astype(np.float32) / 255.0
    blob = np.expand_dims(np.transpose(img, (2, 0, 1)), axis=0)

    # 模型推理
    outs = net.run(None, {net.get_inputs()[0].name: blob})[0].squeeze(axis=0)

    # 输出坐标矫正
    outs = cal_outputs(outs,nl,na,model_w,model_h,anchor_grid,stride)

    # 检测框计算
    img_h,img_w,_ = np.shape(img0)
    boxes,confs,ids = post_process_opencv(outs,model_h,model_w,img_h,img_w,thred_nms,thred_cond)

    return  boxes,confs,ids
```

```python
def cal_outputs(outs,nl,na,model_w,model_h,anchor_grid,stride):

    row_ind = 0
    grid = [np.zeros(1)] * nl
    for i in range(nl):
        h, w = int(model_w/ stride[i]), int(model_h / stride[i])
        length = int(na * h * w)
        if grid[i].shape[2:4] != (h, w):
            grid[i] = _make_grid(w, h)

        outs[row_ind:row_ind + length, 0:2] = (outs[row_ind:row_ind + length, 0:2] * 2. - 0.5 + np.tile(
            grid[i], (na, 1))) * int(stride[i])
        outs[row_ind:row_ind + length, 2:4] = (outs[row_ind:row_ind + length, 2:4] * 2) ** 2 * np.repeat(
            anchor_grid[i], h * w, axis=0)
        row_ind += length
    return outs
```

```python
def _make_grid( nx, ny):
        xv, yv = np.meshgrid(np.arange(ny), np.arange(nx))
        return np.stack((xv, yv), 2).reshape((-1, 2)).astype(np.float32)
```

```python
def post_process_opencv(outputs,model_h,model_w,img_h,img_w,thred_nms,thred_cond):
    conf = outputs[:,4].tolist()
    c_x = outputs[:,0]/model_w*img_w
    c_y = outputs[:,1]/model_h*img_h
    w  = outputs[:,2]/model_w*img_w
    h  = outputs[:,2]/model_h*img_h
    p_cls = outputs[:,5:]
    if len(p_cls.shape)==1:
        p_cls = np.expand_dims(p_cls,1)
    cls_id = np.argmax(p_cls,axis=1)

    p_x1 = np.expand_dims(c_x-w/2,-1)
    p_y1 = np.expand_dims(c_y-h/2,-1)
    p_x2 = np.expand_dims(c_x+w/2,-1)
    p_y2 = np.expand_dims(c_y+h/2,-1)
    areas = np.concatenate((p_x1,p_y1,p_x2,p_y2),axis=-1)

    areas = areas.tolist()
    ids = cv2.dnn.NMSBoxes(areas,conf,thred_cond,thred_nms)
    return  np.array(areas)[ids],np.array(conf)[ids],cls_id[ids]
```