# 视觉驱动机械臂自主抓取

### 软件环境:

Ubuntu20.04 + ROS-Noetic + OpenCV4.2 + Python3.8

#### 硬件环境:

机械臂RoArm-M2-S + 相机Nuwa-HP60C

## 核心文件说明:

home/rm/ascam\_ws/src/yahboomcar\_mediapipe/scripts文件夹下:

00\_demo.py: 物体识别与坐标检测;

grasp1.py: 以眼在手外的方式实现机械臂自主抓取物体;

grasp2.py: 以眼在手上的方式实现机械臂自主抓取物体。

## 环境搭建与程序运行步骤:

相机环境搭建步骤详见"环境搭建"pdf文件;

安装ROS依赖:

sudo apt install ros-\$ROS-DISTRO-cv-bridge ros-\$ROS-DISTRO-sensor-msgs ros-\$ROSDISTRO-std-msgs

虚拟环境中安装python第三方依赖:

pip install opencv-python numpy pyserial ultralytics

#### 运行步骤:

- 1. 启动roscore
- 2. 启动相机

roslaunch ascamera hp60c.launch

3. 打开新终端,激活已经建立好的Python3.8虚拟环境(以ros\_venv虚拟环境名为例)

source ~/ros\_venv/bin/activate

4. 为虚拟环境设置环境变量分配内存

export LD\_PRELOAD=/usr/lib/aarch64-linux-gnu/libgomp.so.1

5. 运行视觉抓取程序

python3 grasp2.py --port /dev/ttyUSB0

```
rostopic pub /detect std_msgs/Empty "{}" -1
```

只有检测到触发信号相机才会开始探测物体,每次触发将持续识别3秒钟,如图:

```
(base) rm@rm:~/ascam_ws/src/yahboomcar_mediapipe/scripts$ rostopic pub /detect std_msgs/Empty "{}" -1 publishing and latching message for 3.0 seconds
```

#### 7. 演示结果

下图展示了物体识别与坐标检测程序运行的结果图:

```
rm@rm: ~/ascam_ws
  roscore h...
                     rm@rm: ~...
                                        rm@rm: ~... ×
                                                          rm@rm: ~... →
                                                                              rm@rm: ~...
process[yolov8_Detector-1]: started with pid [20879]
Error reading from /home/rm/.config/Ultralytics/settings.json: "No Ultralytics s etting 'openvino_msg'. \nView Ultralytics Settings with 'yolo settings' or at '/home/rm/.config/Ultralytics/settings.json'\nUpdate Settings with 'yolo settings
key=value', i.e. 'yolo settings runs_dir=path/to/dir'. For help see https://docs
.ultralytics.com/quickstart/#ultralytics-settings."
Creating new Ultralytics Settings v0.0.6 file V
View Ultralytics Settings with 'yolo settings' or at '/home/rm/.config/Ultralyti
cs/settings.json'
Update Settings with 'yolo settings key=value', i.e. 'yolo settings runs_dir=pat
h/to/dir'. For help see https://docs.ultralytics.com/quickstart/#ultralytics-set
tings.
≉ 脚本开始执行.
开始加载 YOLOV8 模型...
Downloading https://github.com/ultralytics/assets/releases/download/v8.3.0/yolov
8n.pt to 'yolov8n.pt'...
100%
                                                     | 6.25M/6.25M [00:01<00:00, 4.34MB/s]
[INFO] [1760167239.556571]: ✔ YOLOV8 模型 (yolov8n.pt) 加载完成
[INFO] [1760167239.583368]: ● 节点初始化完成,等待图像数据和 /detect 触发信号...
[INFO] [1760167364.145752]: 🖋 收到 /detect 信号,开始对当前帧进行单次检测...
[INFO] [1760167706.250398]: 🖋 收到 /detect 信号,开始对当前帧进行单次检测...
[INFO] [1760167707.337607]: 🥄 物体 1: 类别=person,置信度=0.86,3D坐标=(X=0.045
 Y=0.026, Z=0.464) [米]
[INFO] [1760167707.342933]: 🔍 物体 2: 类别=cell phone, 置信度=0.44, 3D坐标=(X=0
.165, Y=-0.064, Z=0.535) [米]
^C[yolov8_Detector-1] killing on exit
shutting down processing monitor...
... shutting down processing monitor complete
(ros_venv) (base) rm@rm:~/ascam_ws$
```

#### 下图展示了眼在手上机械臂自主抓取程序运行的完整的流程: