

ROS2 巡线功能使用与讲解

1.功能简介

ROS2 当中的巡线功能，主要是通过 RGB 相机识别地面对应颜色的线条实现小车巡线，具体效果表现为：巡线功能启动后，小车会跟随对应颜色线条轨迹向前进行匀速移动、并始终使线条处于小车居中位置。

2.使用方法

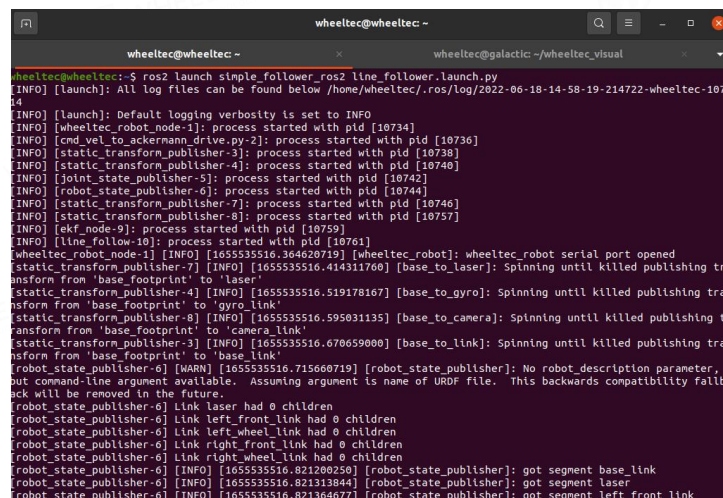
line_follower.launch.py 启动视觉巡线功能，包括底盘控制节点和 USB 相机启动节点。通过以下指令远程登录到小车端，注意登录时需要添加-Y 参数，开启终端打开弹窗的权限。

```
ssh -Y wheeltec@192.168.0.100
```

运行指令：

```
ros2 launch simple_follower_ros2 line_follower.launch.py
```

运行程序：



```
wheeltec@wheeltec ~  
wheeltec@wheeltec:~$ ros2 launch simple_follower_ros2 line_follower.launch.py  
[INFO] [launch]: All log files can be found below /home/wheeltec/.ros/log/2022-06-18-14-58-19-214722-wheeltec-107  
[INFO] [launch]: Default logging verbosity is set to INFO  
[INFO] [wheeltec_robot_node-1]: process started with pid [10734]  
[INFO] [cmd_vel_to_ackermann_drive-2]: process started with pid [10736]  
[INFO] [static_transform_publisher-3]: process started with pid [10738]  
[INFO] [static_transform_publisher-4]: process started with pid [10740]  
[INFO] [joint_state_publisher-5]: process started with pid [10742]  
[INFO] [robot_state_publisher-6]: process started with pid [10744]  
[INFO] [static_transform_publisher-7]: process started with pid [10746]  
[INFO] [static_transform_publisher-8]: process started with pid [10757]  
[INFO] [ekf_node-9]: process started with pid [10759]  
[INFO] [line_follower-10]: process started with pid [10761]  
[INFO] [wheeltec_robot_node-1] [INFO] [1655535516.364620719] [wheeltec_robot]: wheeltec_robot serial port opened  
[static_transform_publisher-7] [INFO] [1655535516.414311760] [base_to_laser]: Spinning until killed publishing tra  
nsform from 'base_footprint' to 'laser'  
[static_transform_publisher-4] [INFO] [1655535516.519178167] [base_to_gyro]: Spinning until killed publishing tra  
nsform from 'base_footprint' to 'gyro_link'  
[static_transform_publisher-8] [INFO] [1655535516.595031135] [base_to_camera]: Spinning until killed publishing t  
ransform from 'base_footprint' to 'camera_link'  
[static_transform_publisher-3] [INFO] [1655535516.670659000] [base_to_link]: Spinning until killed publishing tra  
nsform from 'base_footprint' to 'base_link'  
[robot_state_publisher-6] [WARN] [1655535516.715660719] [robot_state_publisher]: No robot_description parameter,  
but command-line argument available. Assuming argument is name of URDF file. This backwards compatibility fallback  
will be removed in the future.  
[robot_state_publisher-6] Link laser had 0 children  
[robot_state_publisher-6] Link left_front_link had 0 children  
[robot_state_publisher-6] Link left_wheel_link had 0 children  
[robot_state_publisher-6] Link right_front_link had 0 children  
[robot_state_publisher-6] Link right_wheel_link had 0 children  
[robot_state_publisher-6] [INFO] [1655535516.821200250] [robot_state_publisher]: got segment base_link  
[robot_state_publisher-6] [INFO] [1655535516.821313044] [robot_state_publisher]: got segment laser  
[robot_state_publisher-6] [INFO] [1655535516.821364677] [robot_state_publisher]: got segment left front link
```

图 1 运行 line_follower.launch.py

在弹出的弹窗选择小车进行巡线的颜色，以蓝色为例，将滑块滑到【2】，在窗口中白色为识别到指定颜色的结果。

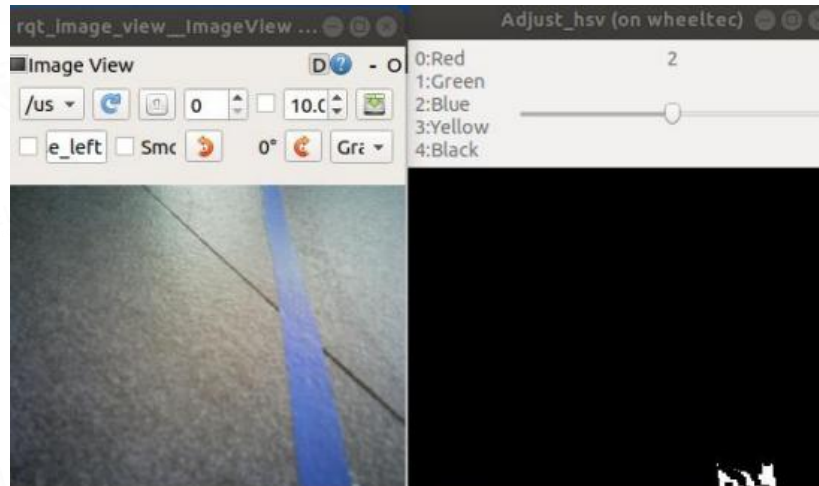


图 2 运行 line_follower.launch.py 效果

3.注意事项

如果想要使用如 C70 之类的 UVC 协议相机进行巡线，可以在巡线启动文件中把参数 `bool_usbcam` 改为 `true`，如图 3-1 中所示，目前为了适配不同的相机和别名规则，外置了参数接口（默认接口为 C70 相机的串口别名：`/dev/Rgbcam`），可自行根据需求修改。

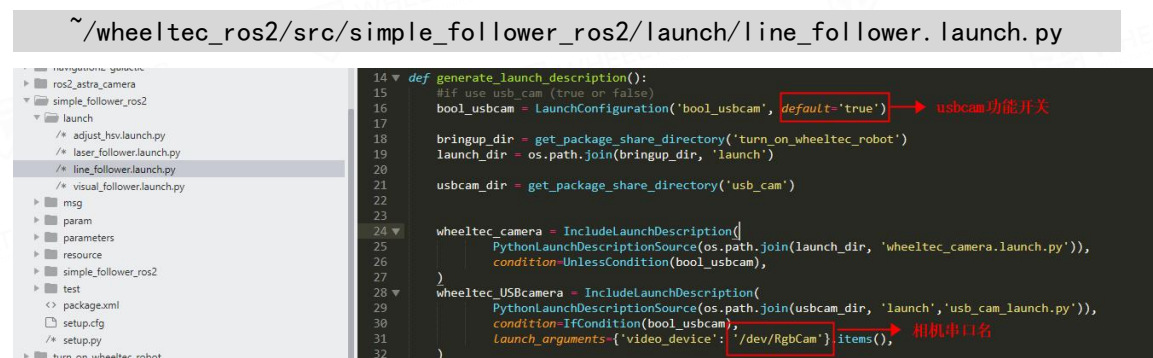


图 3 line_follower.launch.py 文件

4.功能讲解

巡线功能涉及源码主要存放于工作空间下 `simple_follower_ros2` 功能包中，启动文件 `line_follower.launch.py` 中主要涉及两个部分，分别是开启底盘和相机硬件配件，以及启动巡线相关的节点。巡线节点负责订阅相机传来的 RGB 话题 `/camera/color/image_raw`，并用 `opencv` 对订阅到的图像进行处理包括图像格式转换，图像腐蚀膨胀，去除无效背景保留目标图像，最后根据目标图像（对应颜色线条）在相机整体图像中的位置进行计算，并根据计算结果对小车的角速度进行

实时调整，加上设置的小车固定线速度，小车就能完成巡线的操作了。

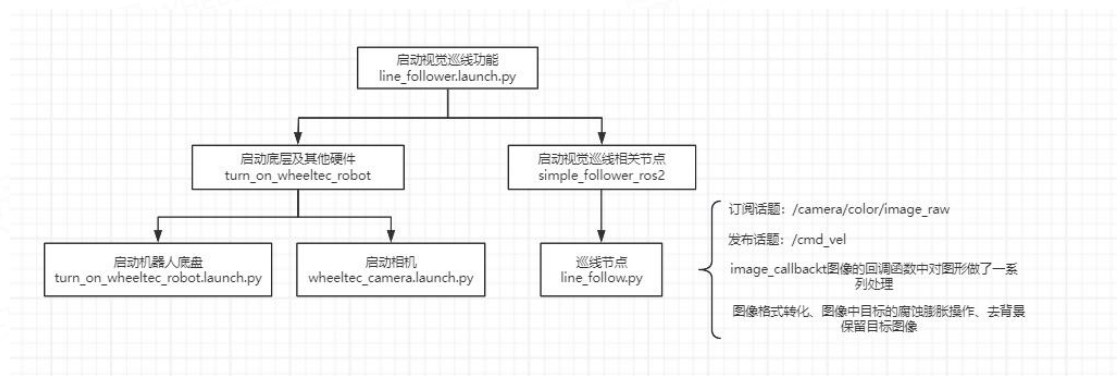


图 4 功能节点示意图

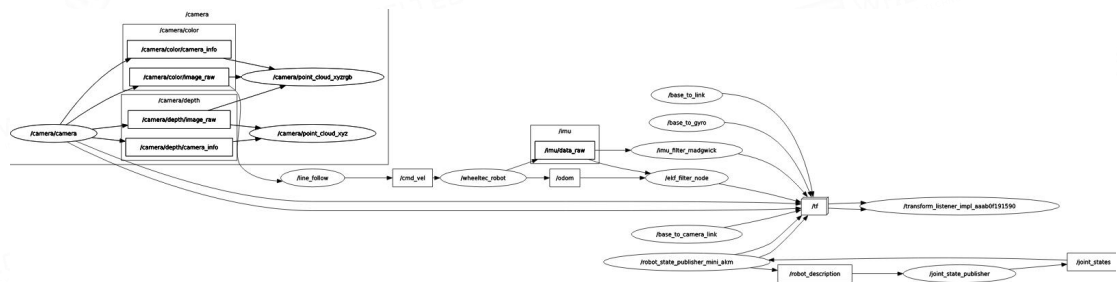


图 5 雷达跟随功能对应的 rqt_graph