

Obstacle avoidance

1. Program function description

After the program is started, the mechanical dog will move forward. When an obstacle appears within the detection range, it will adjust its posture to avoid the obstacle, and then continue to move forward. If the handle node is activated.

2. Program code reference path

The source code of this function is located at,

```
#pi4version
/home/pi/cartographer_ws2/src/yahboom_laser/yahboom_laser/laser_Avoidance_xgo_RS200.py

#pi5version
/root/yahboomcar_ws/src/yahboom_laser/yahboom_laser/laser_Avoidance_xgo_RS200.py
```

3. Program startup

3.1. Start command

PI4 version driver:

The mechanical dog chassis and radar have been set to start automatically at boot. If you find that they have not started, please enter in the terminal.

```
sudo systemctl restart YahboomStart.service
```

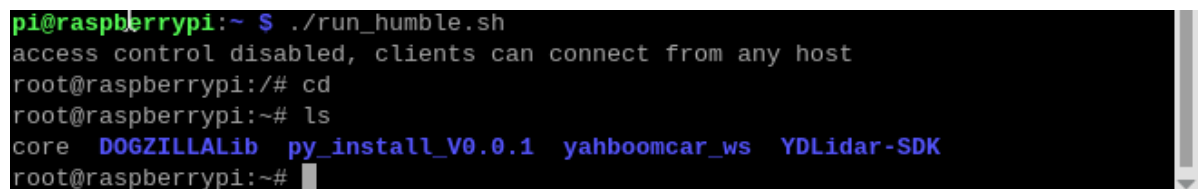
If the radar and chassis are started, you need to enter in the terminal:

```
cd /home/pi/cartographer_ws2
source install/setup.bash
#Start radar obstacle avoidance program Radar MS200
ros2 run yahboom_laser laser_Avoidance_xgo_RS200
```

PI5 version driver:

Open a terminal in the root directory of the Raspberry Pi and enter the following command to enter docker:

```
./run_humble.sh
```



```
pi@raspberrypi:~ $ ./run_humble.sh
access control disabled, clients can connect from any host
root@raspberrypi:~# cd
root@raspberrypi:~# ls
core DOGZILLALib py_install_V0.0.1 yahboomcar_ws YDLidar-SDK
root@raspberrypi:~#
```

Then enter the following command in the docker terminal to start the radar data:

```
ros2 launch bringup Navigation_bringup.launch.py
```

Then enter the command to run the obstacle avoidance program, ** (PI5 version needs to enter the same docker to run, please refer to "Introduction and Use of Radar" for steps)**

```
#Start radar obstacle avoidance program Radar MS200
```

```
ros2 run yahboom_laser laser_Avoidance_xgo_RS200
```

3.2. View the topic communication node diagram

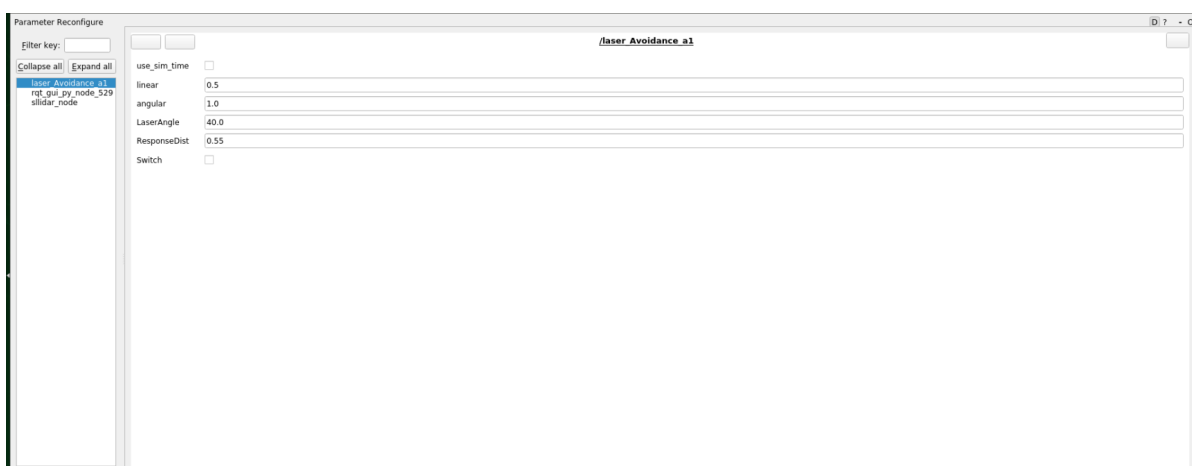
Terminal input, ** (PI5 version needs to run in the same docker, please refer to "Introduction and Use of Radar" for steps)**

```
ros2 run rqt_graph rqt_graph
```



You can also set the parameter size through the dynamic parameter adjuster, terminal input, ** (PI5 version needs to run in the same docker, please refer to "Introduction and Use of Radar" for steps)**

```
ros2 run rqt_reconfigure rqt_reconfigure
```



The meaning of each parameter is as follows:

Parameter name	Parameter meaning
linear	linear speed
angular	angular velocity
LaserAngle	Radar detection angle
ResponseDist	Obstacle detection distance
Switch	Gameplay switch

The above parameters are all adjustable. Except for Switch, the other four need to be set to decimals. After modification, click on the blank space to write.

4. Core source code analysis

Taking the X3 model and the source code of the A1 radar as an example, we mainly look at the callback function of the radar. Here is an explanation of how to obtain the obstacle distance information at each angle.

```
def registerScan(self, scan_data):
    if not isinstance(scan_data, LaserScan): return
    ranges = np.array(scan_data.ranges)
    self.Right_warning = 0
    self.Left_warning = 0
    self.front_warning = 0

    for i in range(len(ranges)):
        angle = (scan_data.angle_min + scan_data.angle_increment * i) *
RAD2DEG#The angle of the radar information is in radians, and it needs to be
converted into an angle for calculation.
        if 160 > angle > 180 - self.LaserAngle:#angle sets the judgment range
based on the structure of the radar
            if ranges[i] < self.ResponseDist*1.5: #range[i] is the result of
radar scanning, here refers to the distance information
                self.Right_warning += 1
        if - 160 < angle < self.LaserAngle - 180:
            if ranges[i] < self.ResponseDist*1.5:
                self.Left_warning += 1
        if abs(angle) > 160:
            if ranges[i] <= self.ResponseDist*1.5:
                self.front_warning += 1
        if self.Joy_active or self.Switch == True:
            if self.Moving == True:
                self.pub_vel.publish(Twist())
                self.Moving = not self.Moving
    return
    self.Moving = True
```

