4. 4. Voice control Autopilot

4.1. Function description

By interacting with the voice recognition module on ROSMASTER, the function of turning on or off the red/blue/green/yellow line of ROSMASTER can be realized by voice, and the R2 key on the handle can cancel/enable this function at any time.

4.2. start

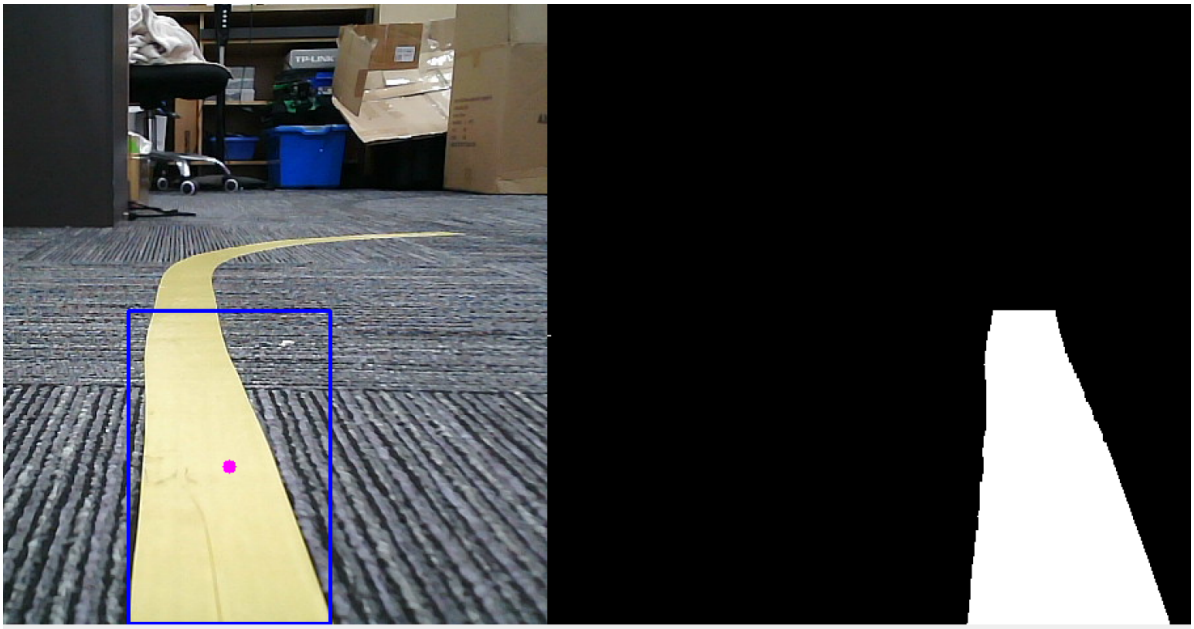
4.2.1. function package path

```
~/yahboomcar/src/yahboomcar_voice_ctrl/
```

4.2.2. Start

```
roslaunch  yahboomcar_voice_ctrl  voice_ctrl_followline.launch   #  control
python3
yahboomcar_ws/src/yahboomcar_voice_ctrl/scripts/voice_Ctrl_follow_line.py
#Enable follow line    function
```

Take patrolling the yellow line as an example, put ROSMASTER on the yellow line, adjust the camera position, and push the camera down. After the program starts, call "Hi Yahboom" to ROSMASTER to wake up the module, when it broadcasts "Hi , I'm here.", it means to wake up the module, then you can say "Tracking the yellow line" to it, ROSMASTER will broadcast "OK, I will track the yellow line".



Then, we release the control of ROSMASTER by pressing the R2 key of the handle, and ROSMASTER starts to patrol the yellow line. If there is no remote control, you can also enter the following commands through the terminal,

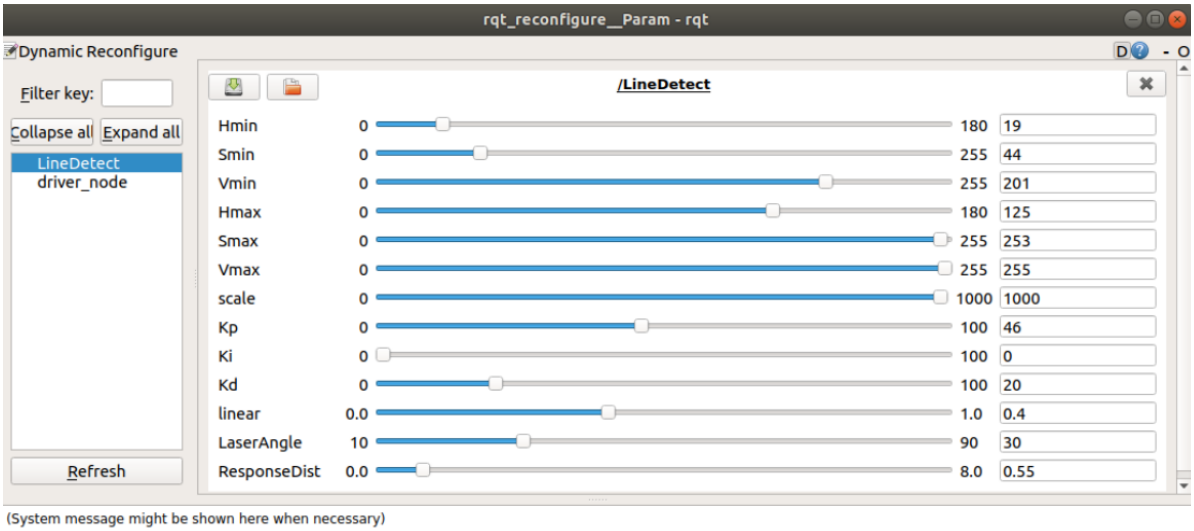
```
rostopic pub /JoyState std_msgs/Bool False
```

If you want to cancel the line patrol function, say "Close the line patrol" to ROSMASTER, ROSMASTER stops, and the voice will broadcast "OK, the line patrol function has been turned off".

4.2.3. Dynamic parameter adjustment

```
rosrun rqt_reconfigure rqt_reconfigure
```

Open the dynamic adjustment parameters, select the LineDetect column, then you can adjust the parameters inside, adjust the parameters, manually modify them to voice_Ctrl_follow_line.py, restart the program to use the adjusted parameters,



4.3. Core code analysis:

4.3.1. Import speech recognition library and create speech recognition object

```
from Speech_Lib import Speech
self.spe = Speech()
```

4.3.2. According to the content recognized by reading the speech, modify the value of hsv_range (process function), and then obtain the value of circle

```
self.command_result = self.spe.speech_read()
self.spe.void_write(self.command_result)

if self.command_result == 23 :
    self.model = "color_follow_line"
    print("red follow line")
    self.hsv_range =  [(0, 106, 175), (180, 255, 255)]

elif self.command_result == 24 :
    self.model = "color_follow_line"
    print("green follow line")
    self.hsv_range =  [(55, 105, 136), (95, 255, 255)]

elif self.command_result == 25 :
    self.model = "color_follow_line"
    print("bule follow line")
    self.hsv_range =  [(55, 134, 218), (125, 253, 255)]

elif self.command_result == 26 :
    self.model = "color_follow_line"
    print("yellow follow line")
    self.hsv_range =  [(17, 55, 187), (81, 255, 255)]
rgb_img, binary, self.circle = self.color.line_follow(rgb_img, self.hsv_range)
```

Note: The value of hsv here can be modified according to the actual situation. Since the camera is more sensitive to light, it may appear that the hsv value here may be different, and the line tracking effect is not very good. The user can adjust the maximum and minimum values of HSV with dynamic parameters, modify the max and min values of the calibrated color HSV into the above code, and use the calibrated values after restarting the program.

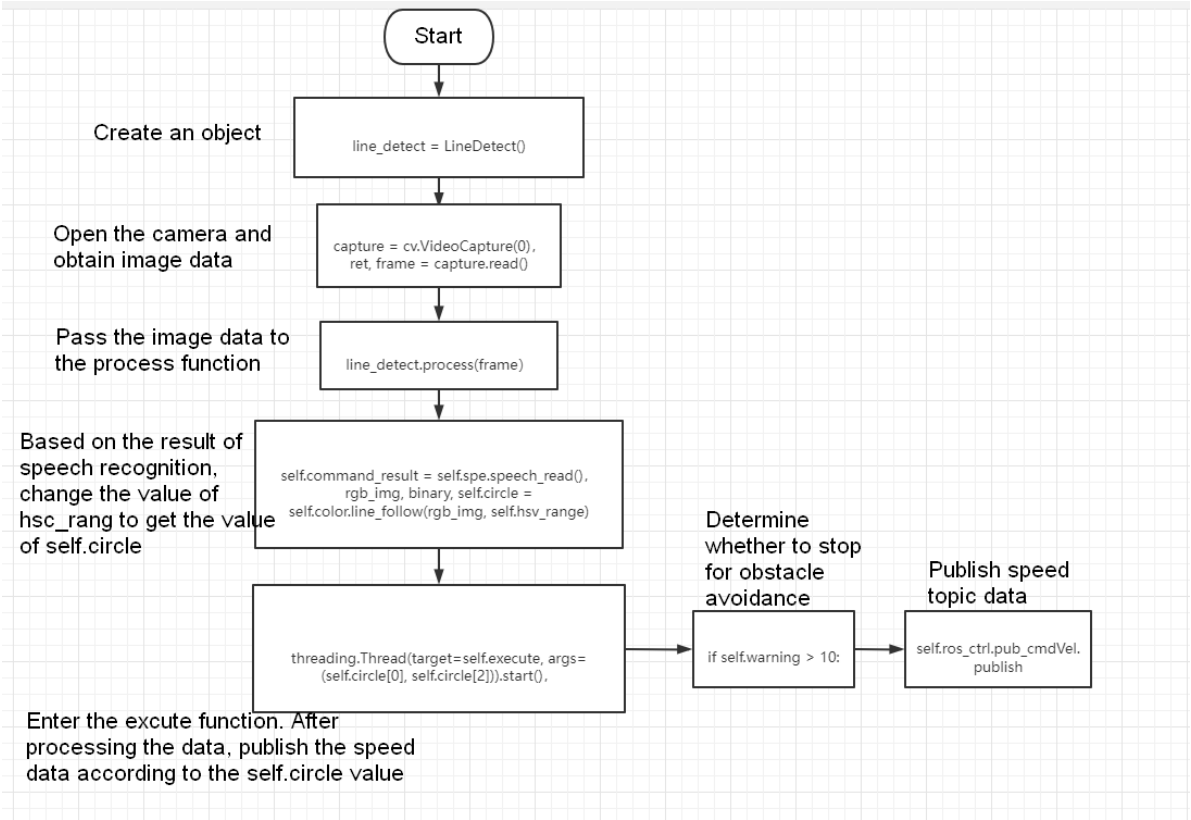
4.3.3. Release speed to chassis (execute function)

```
if color_radius == 0: self.ros_ctrl.pub_cmdVel.publish(Twist())
    else:
        twist = Twist()
        b = Bool()
        [z_Pid, _] = self.PID_controller.update([(point_x - 320)/16, 0])
        if self.img_flip == True: twist.angular.z = +z_Pid
        else: twist.angular.z = -z_Pid
```

```
        twist.linear.x = self.linear
        if self.warning > 10:
            rospy.loginfo("Obstacles ahead !!!")
            self.ros_ctrl.pub_cmdVel.publish(Twist())
            self.Buzzer_state = True
            b.data = True
            self.pub_Buzzer.publish(b)
        else:
            if self.Buzzer_state == True:
                b.data = False
                for i in range(3): self.pub_Buzzer.publish(b)
                self.Buzzer_state = False
            self.ros_ctrl.pub_cmdVel.publish(twist)
```

According to the obtained value of self.circle, it is passed to execute as an actual parameter, data is processed, it is judged whether to avoid obstacles, and finally the speed topic data is released.

4.3.4. Flowchart



The complete code can refer to:

```
~/yahboomcar/src/yahboomcar_voice_ctrl/scripts/voice_Ctrl_follow_line.py
```

4.3.5. Function module communication table

function word	Speech Recognition Module Results	Voice broadcast content
Close tracking mode	22	OK, tracking mode is closed
Tracking the red line	23	OK, I will track the red line
Tracking the green line	24	OK, I will track the green line
Tracking the blue line	25	OK, I will track the blue line
Tracking the yellow line	26	OK, I will track the yellow line