04 -Self-driving Car

Self-driving Car

Basic Teaching Information					
Teaching facility	AI Module 1s	Teaching mode	Project-based learning	Class duration	90 minutes

Teaching Objectives:

1. Learn and understand state control;
2. Study the integrated grayscale sensor (we will use the 3rd channel in the integrated grayscale sensor in this lesson);
3. Review “if repeat” module.

Teaching difficulties:

1. Learn and understand the state control line patrol logic and realize the car line patrol;
2. Learn how to use the integrated grayscale sensor and its applications.

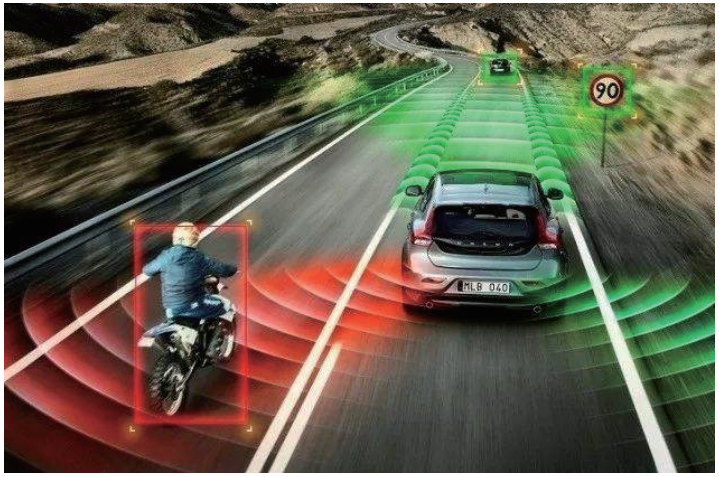
Self-driving Car

Focus

Self-driving cars are intelligent cars that know the road condition through the on-board sensing system, they can plan the driving route automatically and control the car to arrive at the destination. More and more automotive manufacturers and technology companies are participating in the development of self-driving cars. Self-driving cars not only help reduce car accidents, but also reduce traffic congestion dramatically.

Self-driving car covers sensors, computers, artificial intelligence, communication, navigation and positioning, pattern recognition, machine vision, intelligent control and other technologies.

Let's try to design a self-driving car that can follow the route automatically.



Exploration

In this lesson, we need to learn the state control in line patrol algorithm.

1. If we want the car to follow the black line, we need to install a sensor that could tell the colors.

Grayscale sensor can distinguish colors by recognizing gray values of different colors. So we can distinguish the difference between the black line and the surrounding environment by installing the integrated grayscale sensor.

2. Line patrol principle: we use state control algorithm for line patrol. In single-gray patrol, the car does not follow the black line, but the boundary between the black line and the desktop. Standard value is the boundary values for black lines and desktop. By judging the real-time state of the gray sensor, turn left or right to adjust the car.

Standard value calculation method:

(maximum gray value <black line>+ minimum gray value <field>)/2

Self-driving Car

Creation

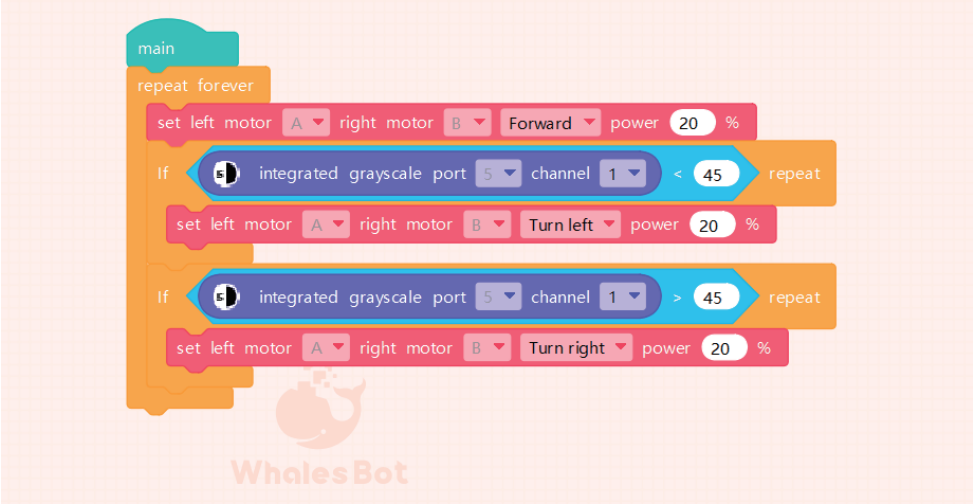
Let’ s build the gray scale line patrol car

1. Use the general chassis and double motors to build the car chassis;

2. Use the integrated grayscale sensor to identify black line and field;

3. Install the universal wheel as the car’ s front wheel;

4. Controller.



Programming

Align the third channel in the middle of the integrated grayscale sensor vertically to the black line and the surrounding field. The blackest value is 80 (non-fixed, to be tested according to the actual situation), the field value is 11, so the average which is the the boundary value is 45.

Use the “if repeat” module to make first judgment. If the infrared value is less than 45, it means the car deviates from white. Then adjust the action to the left.

If the infrared value is greater than 45, indicating the car deviates from black, the motion is continuously adjusted to the right.

Evaluation

Please briefly describe the state control? What are the two states we used in this lesson?

Calculate the standard value according to the field data, and then divide the car into different states according to the standard value, so that the car could execute corresponding commands.

After calculating the standard value, divide the grayscale sensor's value into two ranges, so that the car can make different movements accordingly.

If the grayscale value is less than 45 (use the real value measured in the field), turn left.

If the grayscale value is larger than 45 (use the real value measured in the field), turn right.

Show

Demonstrate the working effect of line patrol car.

Key Point 1: Explain the classification of gray value states in state control line patrol.

Explain the role of gray scale sensors.

Key Point 2: Explain the programming logic and the use of “if repeat” module. Explain the principle of state line patrol.