Lesson 30 Obstacle avoidance car

1. Experimental background

With the continuous development of artificial intelligence technology, it has changed the production methods, lifestyles and ways of thinking of human society, and has also had an important impact on human liberation. Domestic scholars attach great importance to the research on human liberation from the perspective of artificial intelligence and have achieved certain research results, which is of great significance in promoting the realization of the great goal of human liberation . I believe you have also come across many artificial intelligence products, such as home sweeping robots, which can complete sweeping and obstacle avoidance functions on their own. In this lesson we will also design an obstacle avoidance car.

2. Experimental goals

(1) Master the principles of obstacle avoidance

(2) Comprehensive application of if else statements

(3) Comprehensive application of "<", ">" logical operation symbols

(4) Master custom functions

3. Experimental preparation

(1) Main control board

(2) Ultrasonic sensor

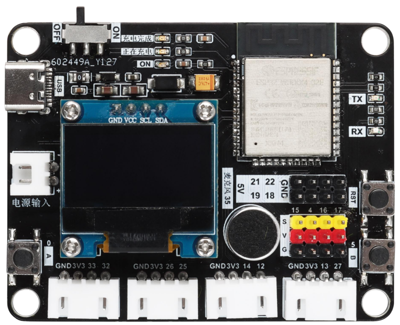
(3) Motor

(4) Steering gear

(5) Building block set

Component introduction

（1）Main control board



Integrated ESP-32 high-performance dual-core chip, supports WiFi communication. Compatible with LEGO holes and can be combined with LEGO bricks. The power supply mode is powered by an external 3.7V battery and supports reverse battery charging. Onboard OLED, microphone, buzzer .

（2）Ultrasonic sensor module

Ultrasonic waves have the advantages of strong directivity, slow energy loss, and long propagation distance in media, and are often used for distance measurement. Due to the slow wave speed in the air, the echo signal contained along the direction of structural information propagation is easy to detect and has very high resolution, so its accuracy is higher than other methods; while ultrasonic sensors have simple structure, small size, reliable signal processing, etc. Features. The use of ultrasonic detection is often faster, more convenient, simpler to calculate, easier to achieve real-time control, and can meet industrial practical requirements in terms of measurement accuracy.

The principle of ultrasonic measurement is to detect the transmission time of ultrasonic waves emitted from the ultrasonic transmitter in the air, and immediately return to the receiver when encountering obstacles on the way through the gas medium. Multiply this time by the speed of sound in the gas (V) to find the distance the sound travels.

According to the time (T) recorded by the timer, the distance (S) from the launch point to the obstacle can be calculated

Formula: $S = V*T/2$

Pin: VCC/Trig/Echo/GND

VCC: power interface

Trig: transmitter

Echo: receiving end

GND: ground

（3）Motor

The motor is also called a motor. It is a motor that can control the direction and speed of rotation. The 4 pins are GND/Signal 1/Signal 2/VCC. In the experimental assembly, we connected pins 18/19 as signal pins to achieve control. The difference in the direction of rotation.

Pin: 5V/S1/S2/GND

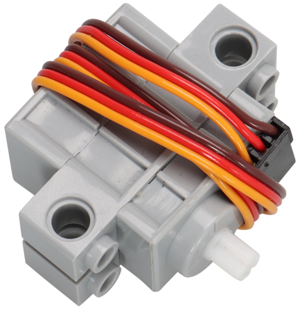
5V: power supply

S1: Signal port 1

S2: Signal port 2

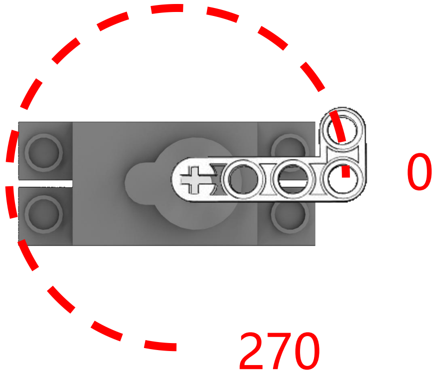
GND: ground

（4）steering gear



The steering gear is a position (angle) servo driver, suitable for control systems that require the angle to continuously change and be maintained. The characteristic is that the speed is smaller than that of the motor, but the power is greater. It is generally used for robotic arms to complete more flexible and difficult movements,and also allows mechanical devices to move more accurately.

Geekservo is a 9g servo combined with Lego. It can be rotated to a specific angle through programming control. The rotation range can be controlled from 0 to 270° during programming.



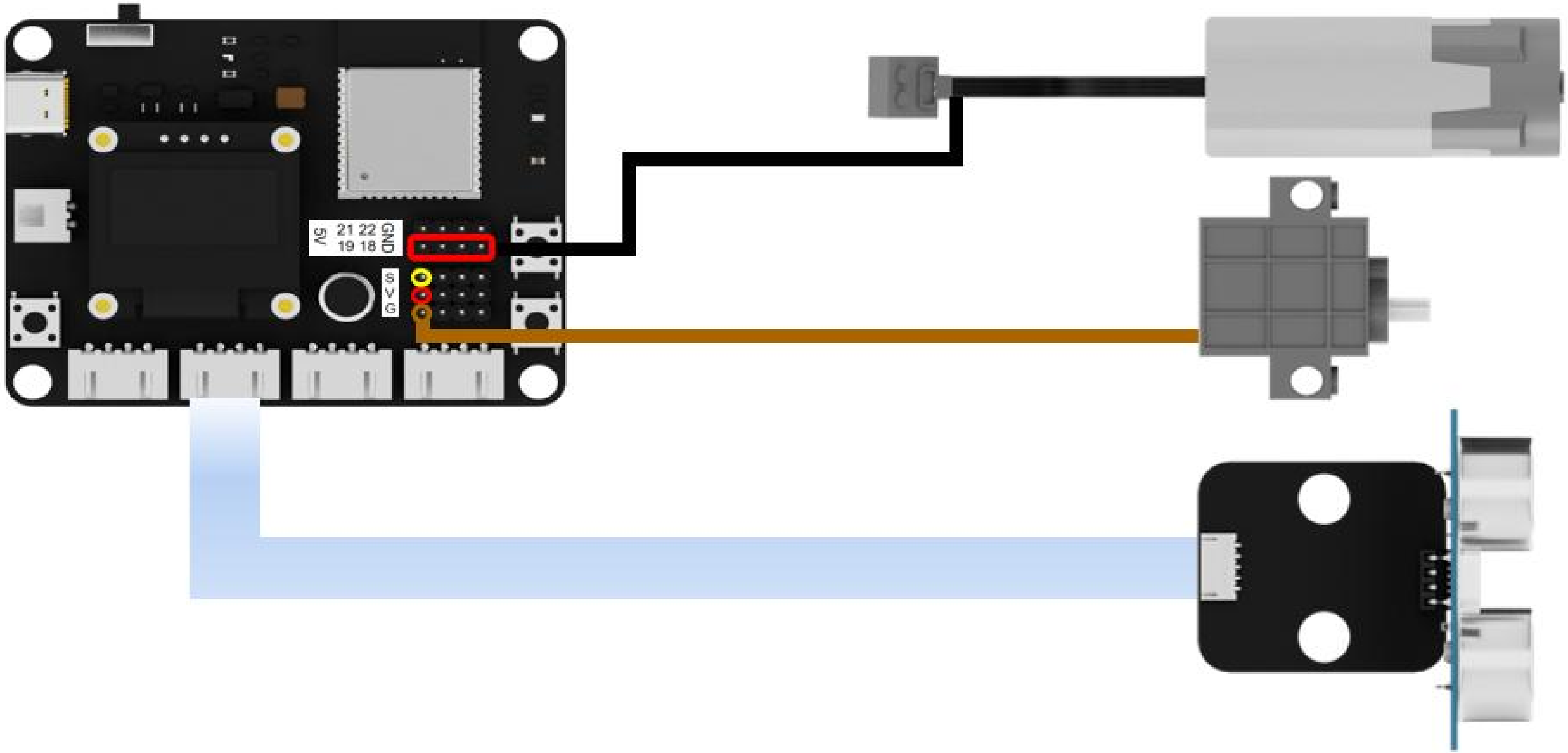
Pin: S/VCC/GND

S: Signal pin (used to control angle)

VCC: power interface

GND: ground

4. Wiring diagram



The ultrasonic sensor is connected to the GND/3V3/26/25 pin of the main control board; the motor 4pin port is connected to the 5V/19/18/GND pin of the main control board; the servo is connected to pin 15 (note the color order of the three wires of the servo) Corresponds to the color of pin S/V/G)

5. Programming

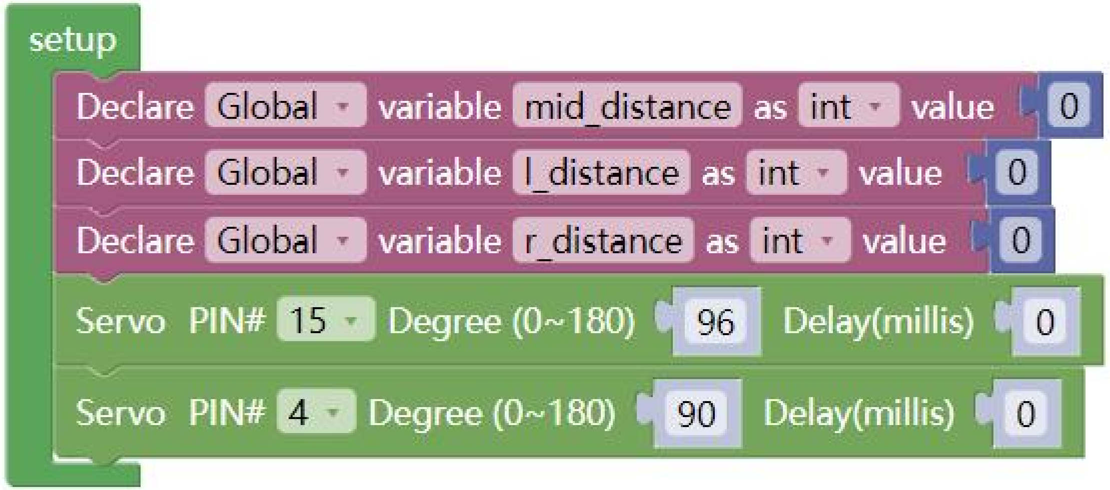
Open Mixly, make sure you have connected the control board to the computer with a type-C cable and selected the board type and COM port number correctly.

（1）Get to know code blocks

Block of code	Function Description	Type
procedure2	Create a function with no output value	Functions
count with i from 1 to 10 step 1 do if true do break out of loop	Break out of a loop when a condition is met in the loop	Control

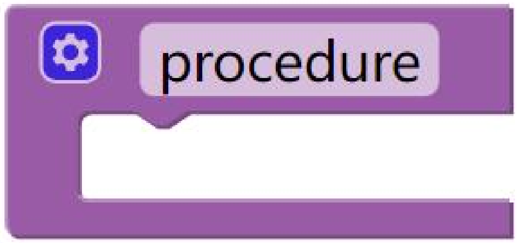
（2）Start programming

Initialize settings, set variables and assign values to variables "mid_distance", "l_distance", "r_distance", set servo pins, angles and delays



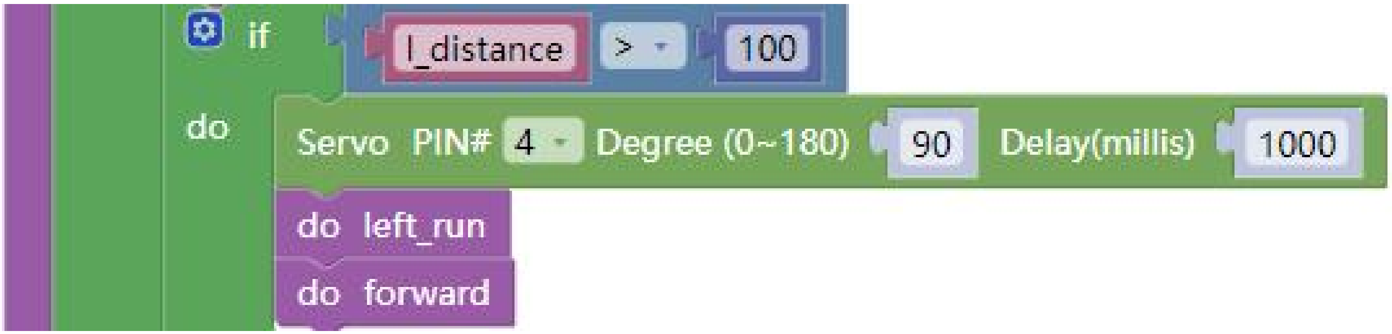
Assign the value measured by ultrasonic sensing to the variable "mid_distance"

Create a function without an output value through the "Function" code type, and perform the corresponding function through the function



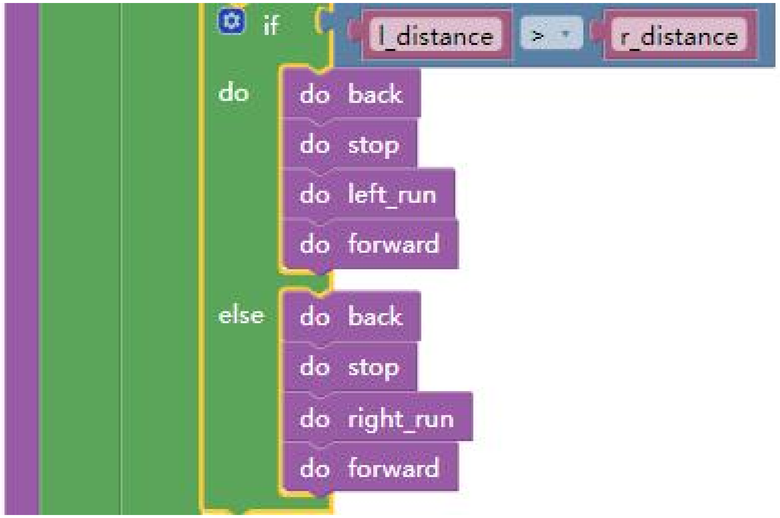
Determine the value of the ultrasonic wave (less than 20). If it is less than 20, the car stops, the steering gear rotates, the ultrasonic wave measures the left and right distance and assigns a value to the variable "l_distance"

If the value on the left measured by the ultrasonic wave is greater than 100, then the steering task will be performed directly



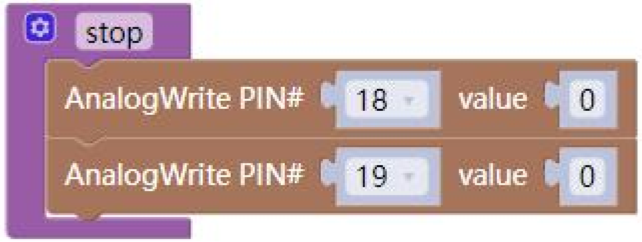
If the left value measured by the ultrasonic wave is less than 100, the steering gear rotates to test the right value, and the ultrasonic measured distance is assigned to the variable "r_distance".

Compare the values on the left and right sides to determine the execution of the car task.

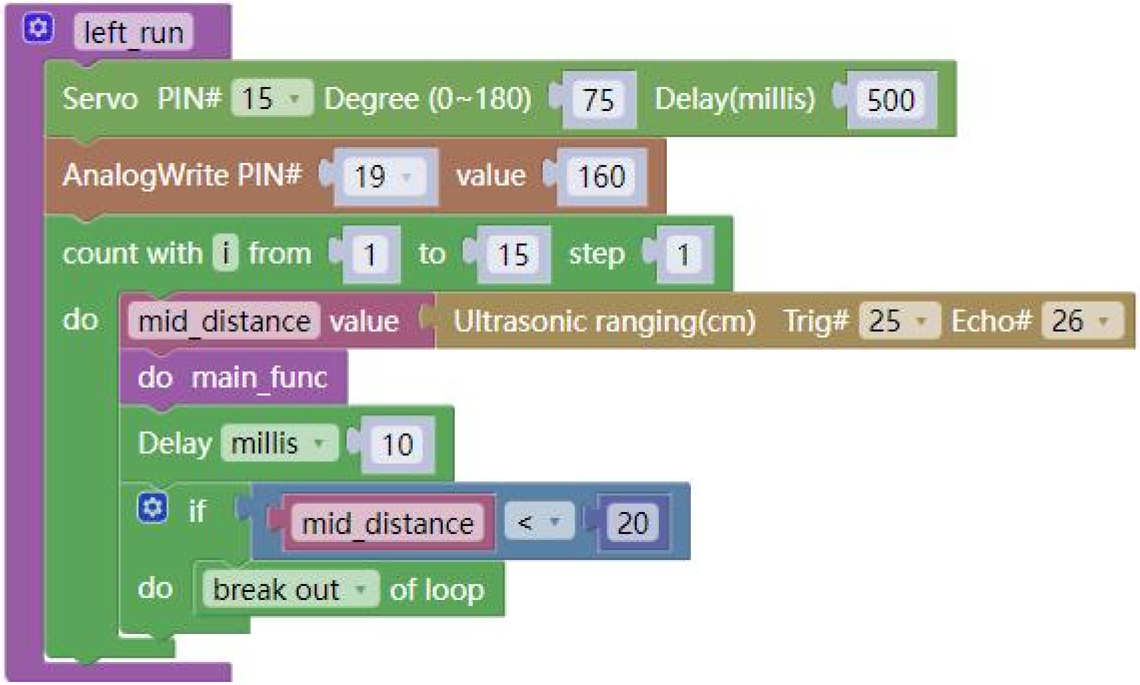


Car function settings such as "execute left_run", "execute right_run", "execute forward", "execute back", "execute stop"

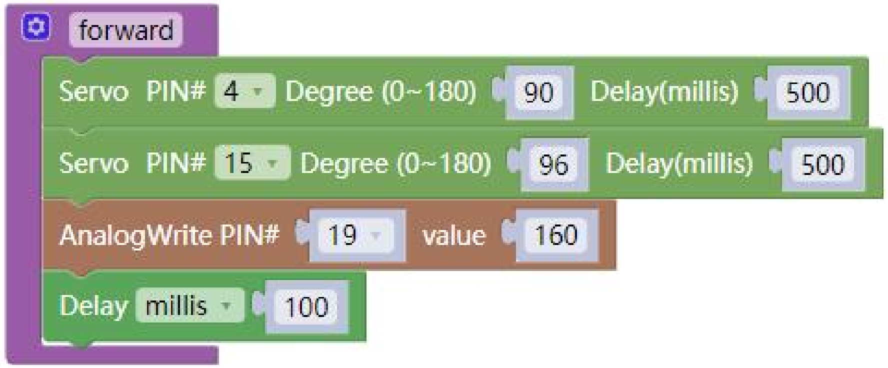
Execute stop:



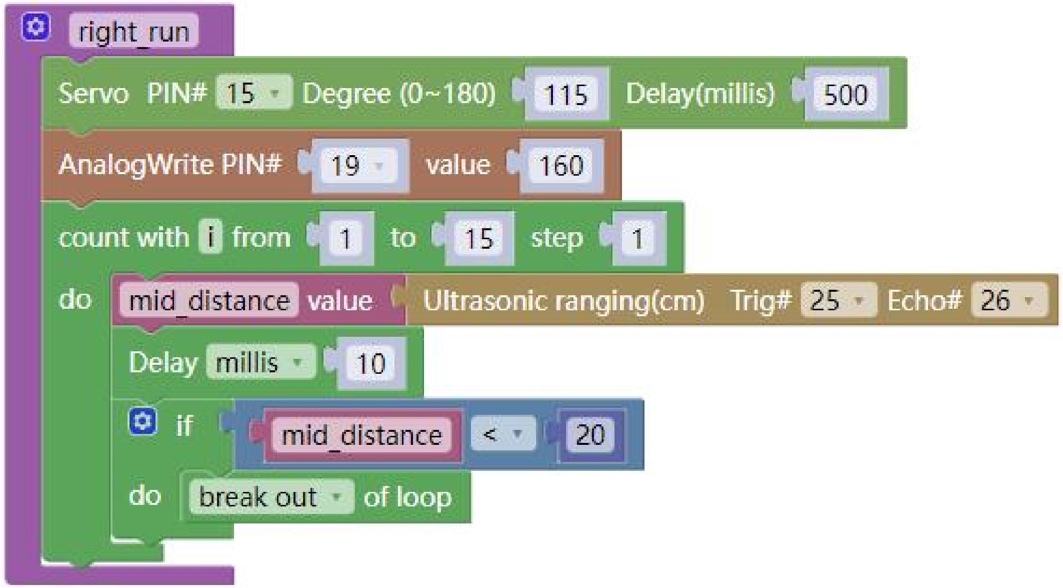
Execute left_run:



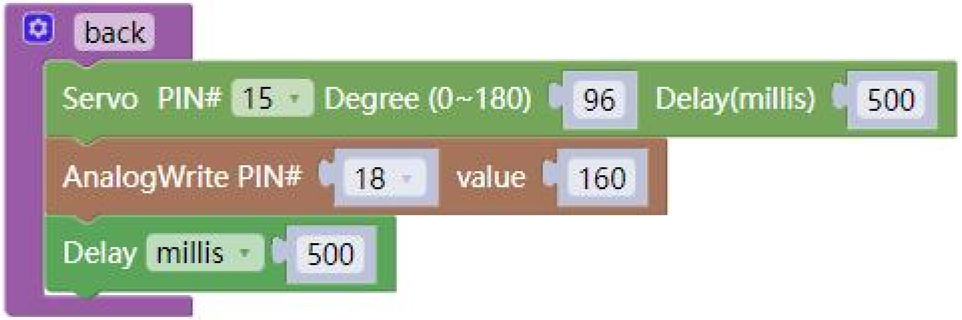
Execute forward:



Execute right_run:



Execute back:



（3）Save the code and upload the programmed code file to the motherboard

6.Achieve results

After the program is uploaded, the car starts running and enters the car reversing mode. When the motor drives the car to reverse, the ultrasonic wave detects that the distance is closer, and the buzzer sounds faster, realizing the function of the reversing radar.