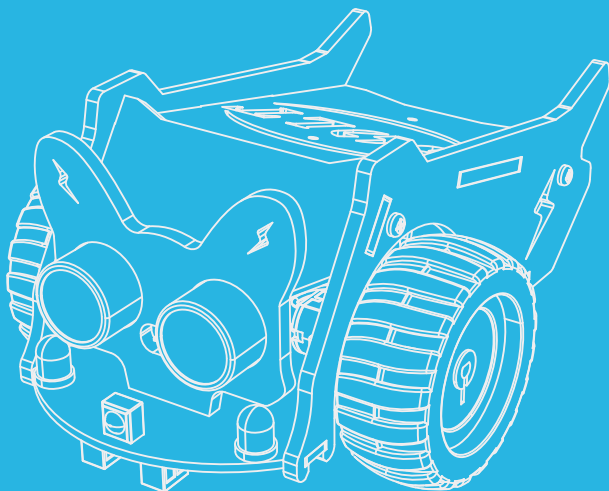


CrowBot BOLT

Programmed Educational Robot car

Beginner's Guide

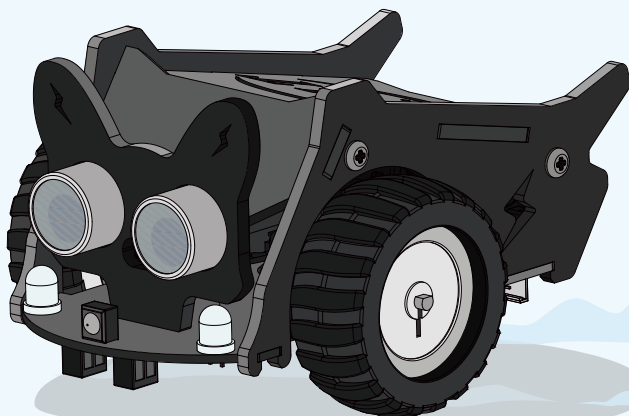


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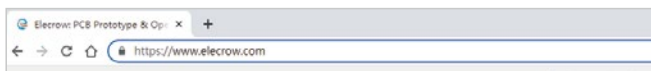
CrowBot Introduction

Hello, master, I am your robot Bolt, nice to meet you, I am a STEAM (science, technology, engineering, art, mathematics) education robot, Elecrow technology planet, want to communicate with me, you need to learn to use Letscode programming software, go to download the software! Let's start the secret journey of science and technology together!

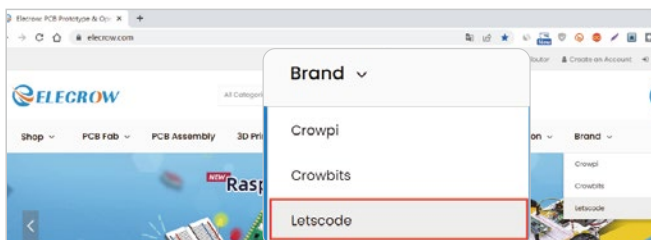


Letscode software installation and use process

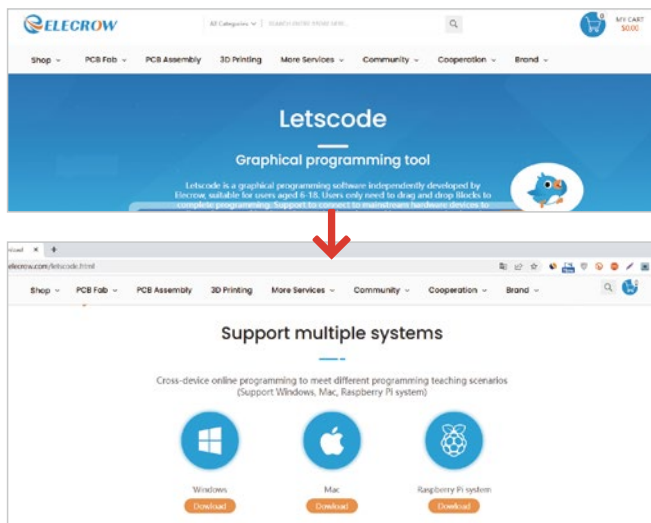
1. Open the website in your browser: <https://www.elecrow.com/>;



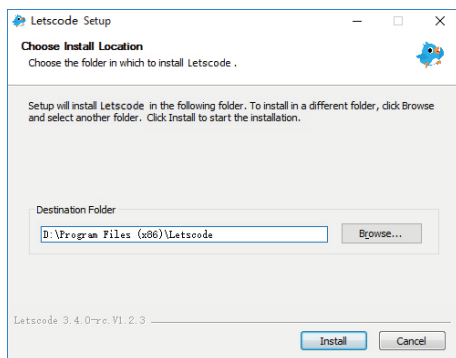
2. Click on the home page: Brand>Letscode, Go to the Download page.;



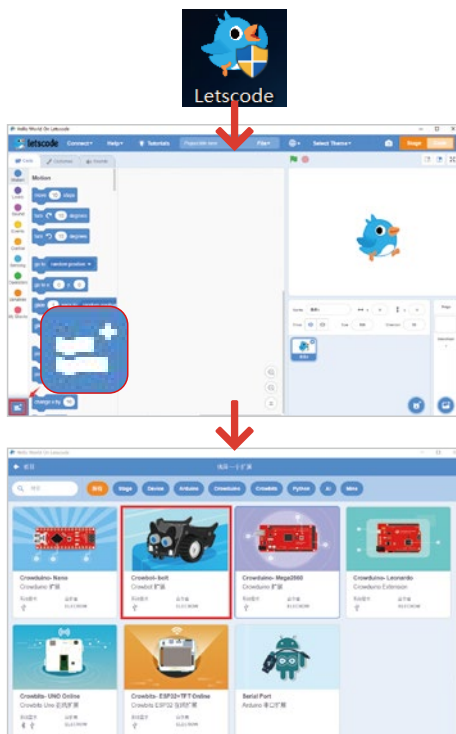
3. Select the corresponding system version from the drop-down list to download the installation package.



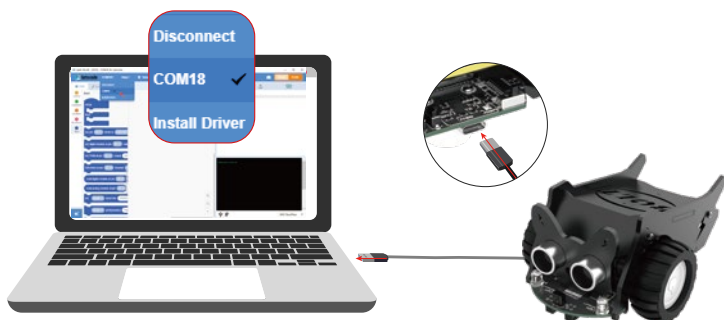
4. Open the installation package, select an installation path, and install the Letscode software.



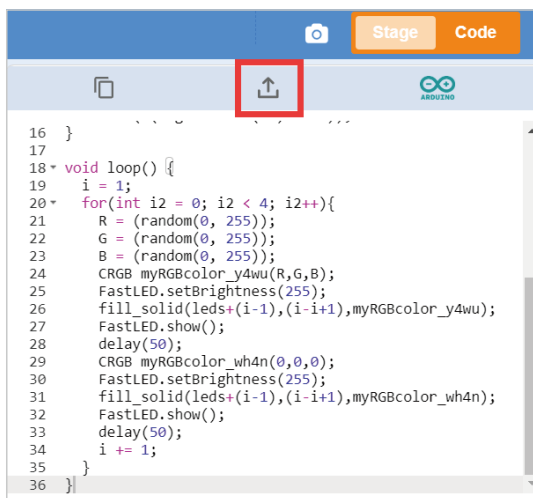
5. Open Letscode software and add Crowbot Bolt extension;



6. Connect the car with the computer using the data line, and select the corresponding COM port;

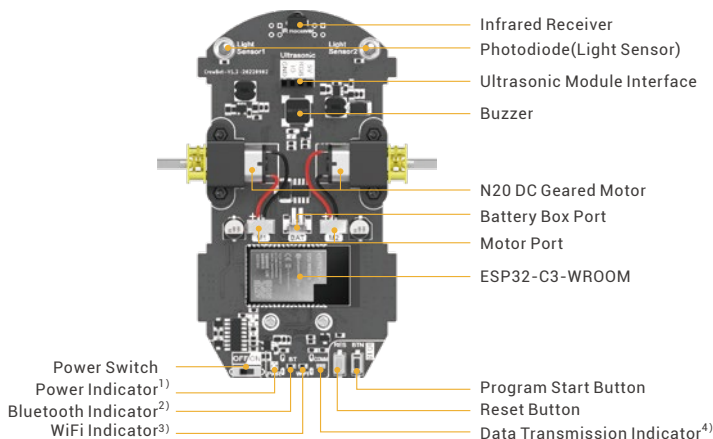


7. Write the program, click the download button in code mode, and wait for the program to be uploaded.



IO Port Diagram

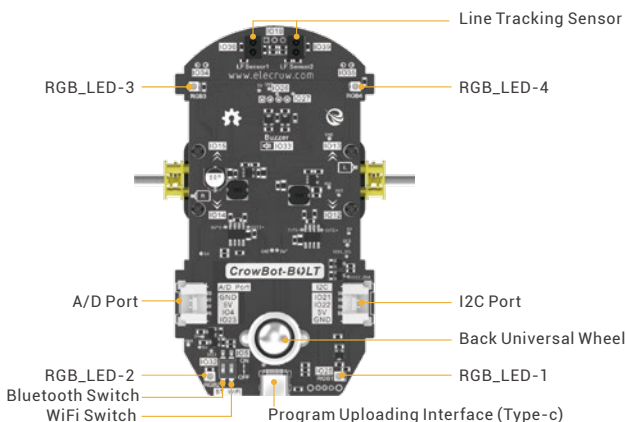
CrowBolt Car Front Overview



Note:

- 1) When the blue light is on, the power is sufficient; When the red light is on, it means that the voltage is lower than 3.3V and the battery needs to be replaced, otherwise the performance of program will be affected.
- 2) When the blue light is on, it means that the Bluetooth function is on.
- 3) When the blue light is on, the WiFi function is on.
- 4) When the blue light is on, it indicates that there is data transmission.

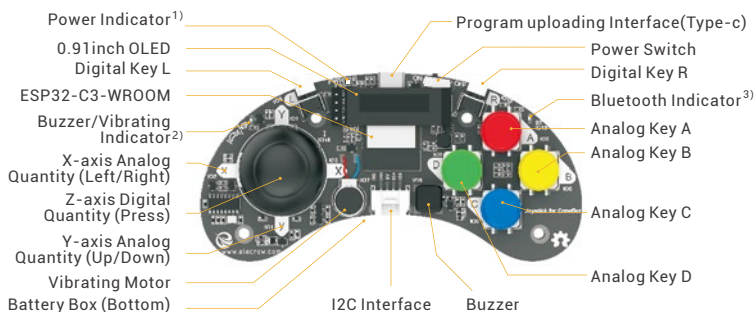
CrowBolt Car Back Overview



Crowbot Bolt Car Port Connection table

NO.	Electronic module	ESP32-C3-WROOM_IO
1	Button(BTN)	IO18
2	RGB1-RGB4	IO25
3	Motor(L)-	IO12
4	Motor(L)+	IO13
5	Motor(R)-	IO14
6	Motor(R)+	IO15
7	Buzzer	IO33
8	Light Sensor 1	IO35
9	Light Sensor 2	IO34
10	Ultrasonic ranging sensor(Ultrasonic)	IO27
11	Ultrasonic ranging sensor_RGB	IO26
12	LF Sensor 1	IO36
13	LF Sensor 2	IO39
14	IR Receiver	IO19
15	WIFI Switch and indicator light	IO5
16	Bluetooth Switch and indicator light	IO32
17	A / D Port	IO4&IO23
18	I2C Port	IO21&IO22

Joystick Overview



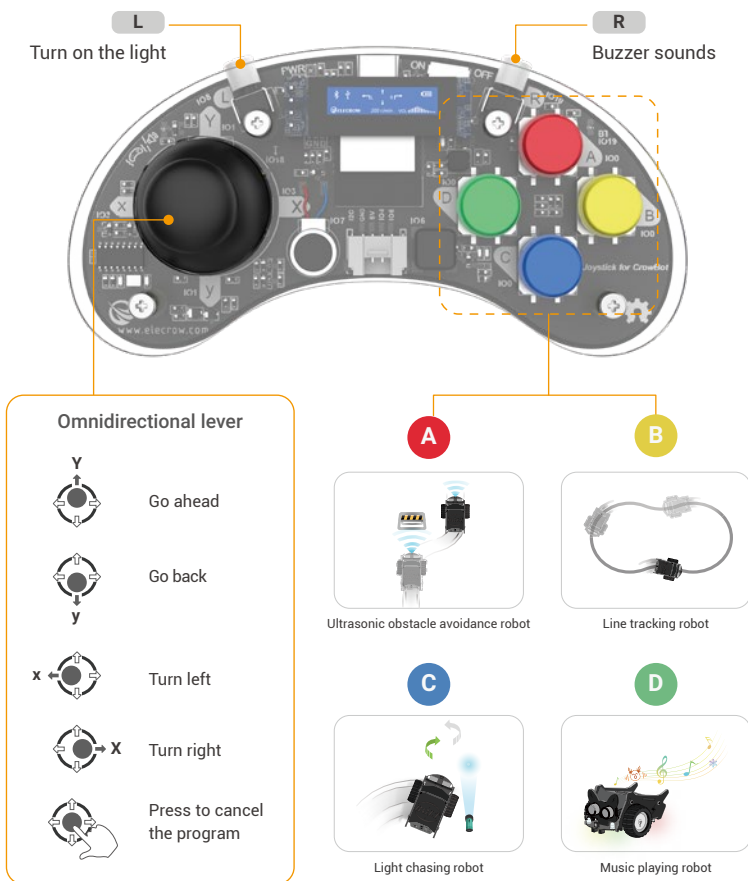
Note:

- 1) When the blue light is on, the power is sufficient; When the red light is on, it means that the voltage is lower than 2.4V and the battery needs to be replaced, otherwise the performance of program will be affected.
- 2) When the green light is on, the buzzer or vibration motor is working.
- 3) When the blue light is always on, the Bluetooth connection is successful; when the blue light is flashing, it means the connection is pending.

Joystick Port Connection table

NO.	Electronic module	ESP32-C3-WROOM_IO
1	0.91 inch OLED_SCL	IO5
2	0.91 inch OLED_SDA	IO4
3	I2C Interface_SCL	IO5
4	I3C Interface_SDA	IO4
5	Buzzer	IO6
6	Vibrating Motor	IO7
7	Digital Key L	IO8
8	Digital Key R	IO10
9	Analog Key A	IO0
10	Analog Key B	IO0
11	Analog Key C	IO0
12	Analog Key D	IO0
13	X-axis Analog Quantity (Left/Right)	IO3
14	Y-axis Analog Quantity (Up/Down)	IO1
15	Z-axis Digital Quantity (Press)	IO18
16	Bluetooth Indicator	IO19

Instructions for Joystick Factory Procedures



Please turn on the Bluetooth switch at the bottom of the CrowBot. After the switches are turned on, the joystick and the CrowBot will automatically connect via Bluetooth.

Notice:

- Preset infrared remote controller functions. If you reload other programs, the above functions will be invalid.
- If you need, visit the product link or contact customer service to ask for this factory setting program.

Instructions for CrowBolt BOLT Car Factory Procedures

Ultrasonic obstacle avoidance robot



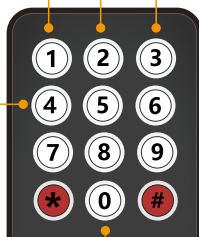
Line tracking robot



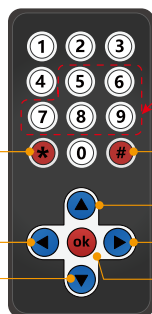
Light chasing robot



Music playing robot



Robot on patrol(3 in 1)



Turn on the light

Buzzer sounds

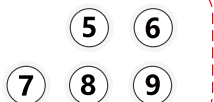
Turn left

Go ahead

Turn right

Go back

Cancel the program



User can customize functions

Notice:

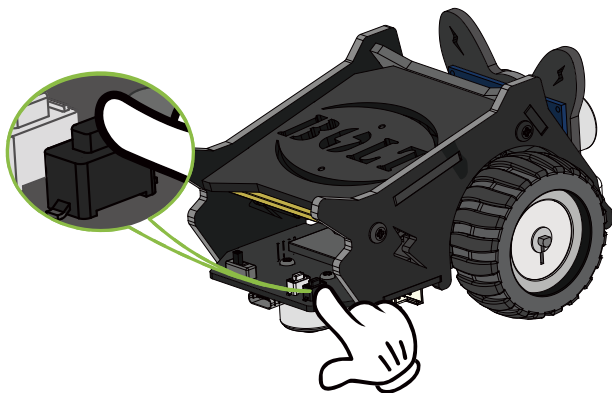
- Preset infrared remote controller functions. If you reload other programs, the above functions will be invalid.
- If you need, visit the product link or contact customer service to ask for this factory setting program.

CrowBot

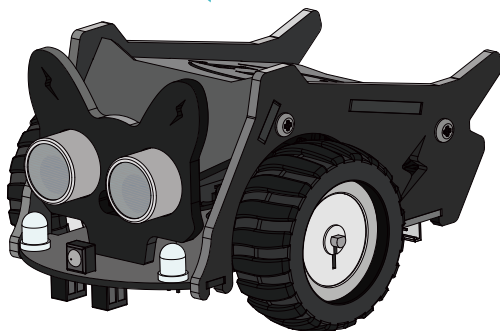


Lesson 1 - Activate Bolt

Edit and download the program, press the button, the serial port prints:
Hello, master! I'm Bolt!, I've activated!



Hello, master!
I'm Bolt!, I've activated!



Knowledge

Button

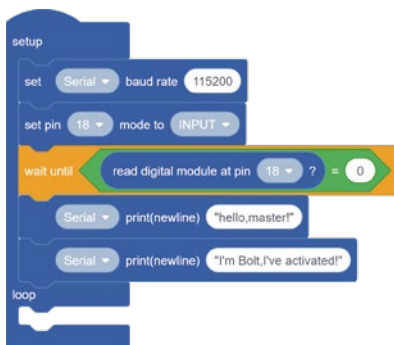
Button refers to the switch that uses the function key to promote the transmission mechanism to open or close the moving circuit breaker and the static contact to complete the power circuit conversion. That is, lightly press the switch to turn on, release it to turn off.



Serial communication function

The serial communication function refers to the function that can transmit data between the peripheral device and the computer.

Program



Challenge

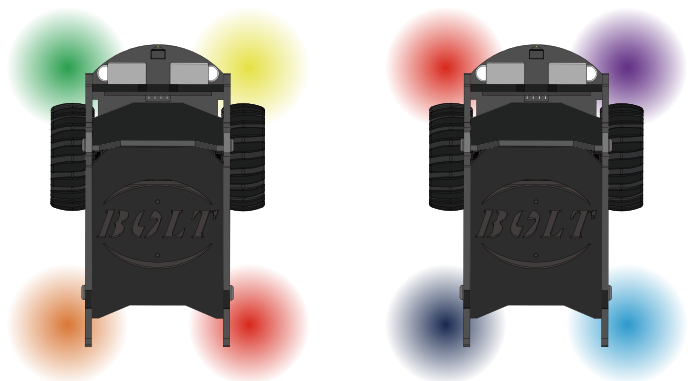
Self-introduction

Each time the start button is pressed, Bolt says a word and introduces himself to the host.



Lesson 2 - Colorful Lights

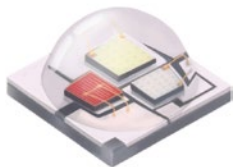
Press the start button, the 4 onboard RGB_LEDs of the Bolt randomly display different colors and present the effect of flowing water lights.



Knowledge

RGB LED

The three primary colors refer to the three basic colors that cannot be decomposed in the color, namely red (Red), green (Green), and blue (Blue). The three primary color light mode of RGB lamp is an additive color model, which adds the color light of the three primary colors in different proportions to generate various different color lights.



Random number module

The value in the two brackets is the range of random numbers, and the random number contains these two values.

pick random 1 to 10

Program

```

setup
  set pin 18 mode to INPUT
  set RGB LED at pin 25 with 4 LEDs
  declare int variable R
  declare int variable G
  declare int variable B
  declare int variable i
  wait until read digital module at pin 18 ? = 0

loop
  set variable i = 1
  repeat 4
    set variable R = pick random 0 to 255
    set variable G = pick random 0 to 255
    set variable B = pick random 0 to 255
    set i to i RGB LED PWM to R R G G B B brightness 255 at pin 25
    delay 0.05 秒
    set i to i RGB LED PWM to R 0 G 0 B 0 brightness 255 at pin 25
    delay 0.05 秒
    set variable i += 1

```

Challenge

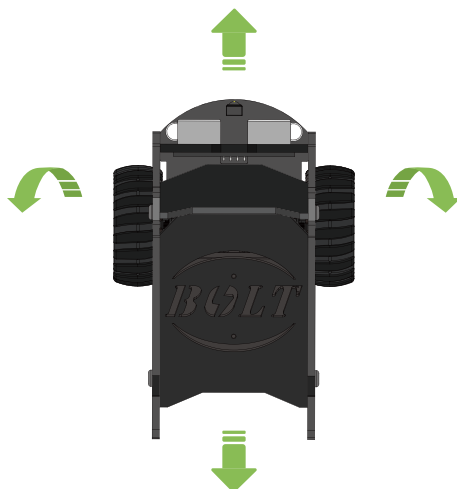
Breathing Light

Press the start button, and the 4 onboard RGB_LEDs of the Bolt randomly display different colors and present a breathing light effect.



Lesson 3 - Dreamy Dance Move

Press the start button, and the Bolt car performs forward, backward, left turn, and right turn actions cyclically, and the duration of each action is 500ms.



Knowledge

DC geared motor

The DC geared motor is based on the ordinary DC motor, plus a matching gear reducer. The function of the gear reducer is to provide a lower speed and a larger torque. At the same time, different reduction ratios of the gear reducer can provide different speeds and torques.



My Blocks

My blocks, when multiple blocks are reused for a function, the blocks can be combined to form a new block. This new building block can replace a large section of building blocks and can be reused many times, concise and clear.



Program



Challenge

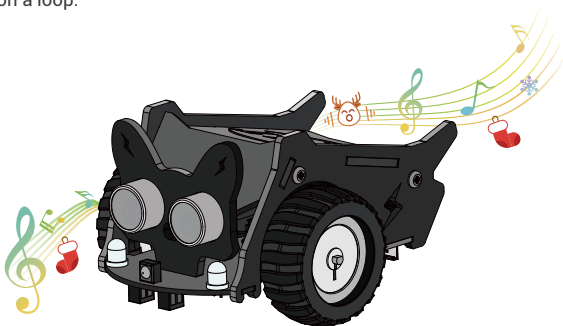
Original Dance

The dance steps and atmosphere lights are independently designed. When the start button is pressed, the Bolt performs original dance movements, and the onboard RGB_LED lights display different lighting effects.



Lesson 4 - Play Music

Press the start button, and the passive buzzer of the Bolt car plays the "Christmas song" on a loop.



Knowledge

Buzzer

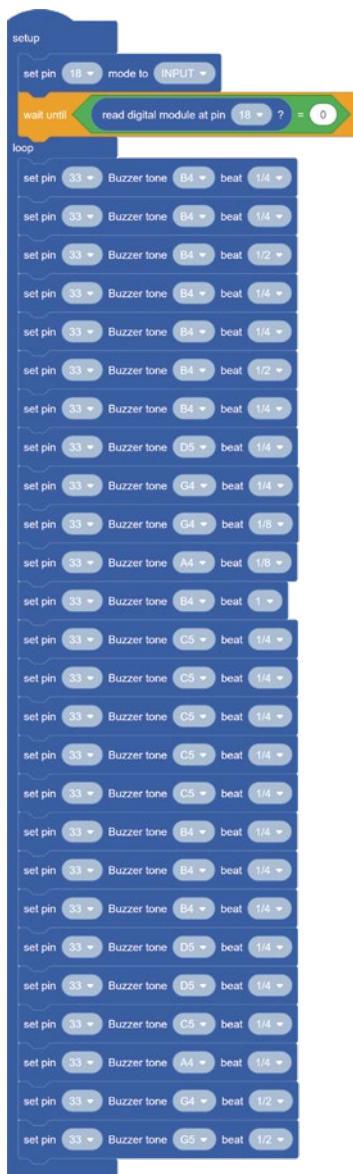
The passive buzzer uses the phenomenon of electromagnetic induction to connect the voice coil to the alternating current, and then the electromagnet formed will attract or repel with the permanent magnet, thereby promoting the diaphragm to sound. Connecting to direct current can only continuously push the diaphragm without producing sound, it can only produce sound when it is turned on or off.



Buzzer tone frequency table

Tone	1	2	3	4	5	6	7
A	441	495	556	589	661	742	833
B	495	556	589	661	742	833	935
C	262	294	330	350	393	441	495
D	294	330	350	393	441	495	556
E	330	350	393	441	495	556	624
F	350	393	441	495	556	624	661
G	393	441	495	556	624	661	742

Program



Challenge

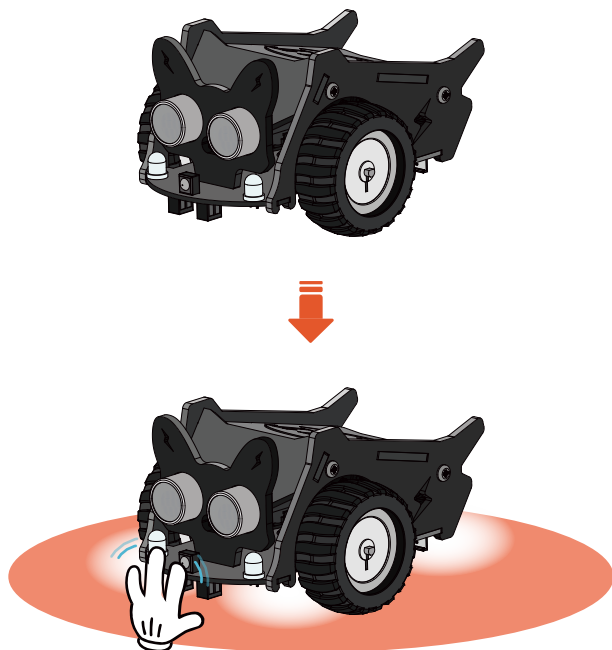
Musician

Design other music independently, press the start button, play your music, and make the RGB_LED light switch colors according to the music rhythm.



Lesson 5 - Photosensitive Light

Press the start button, and the serial port prints the analog values of the two photosensitive sensors in real time, and reversely controls the brightness of the onboard RGB_LEDs according to the brightness of the current environment.



Knowledge

Photodiode

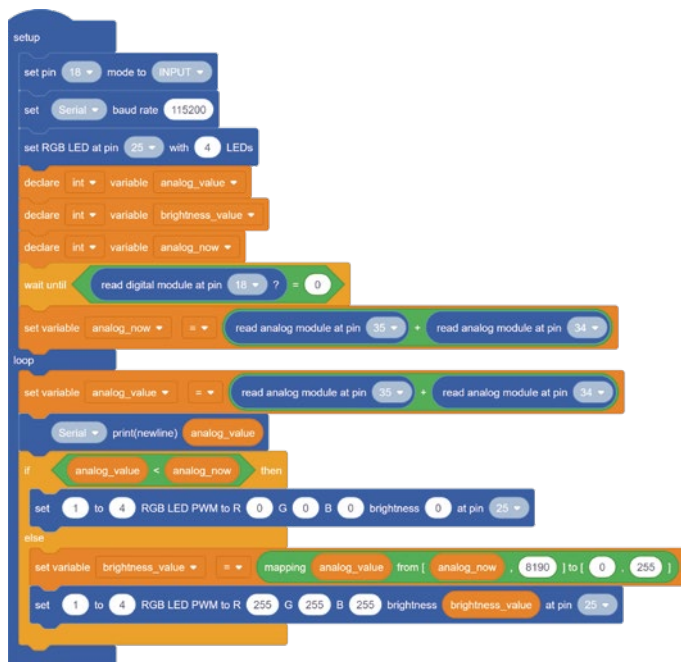
A photodiode is a photoelectric device that uses a silicon PN junction to generate photocurrent after being illuminated. The greater the intensity of the light, the greater the reverse current. The change of light causes the photodiode current to change, which can convert the light signal into an electrical signal and become a photoelectric sensor device.



Value of “analog_Now”

The value of `analog_now` is a standard value that is detected by the sensor under normal lighting conditions. This value needs to be determined as a control before the experiment.

Program



Challenge

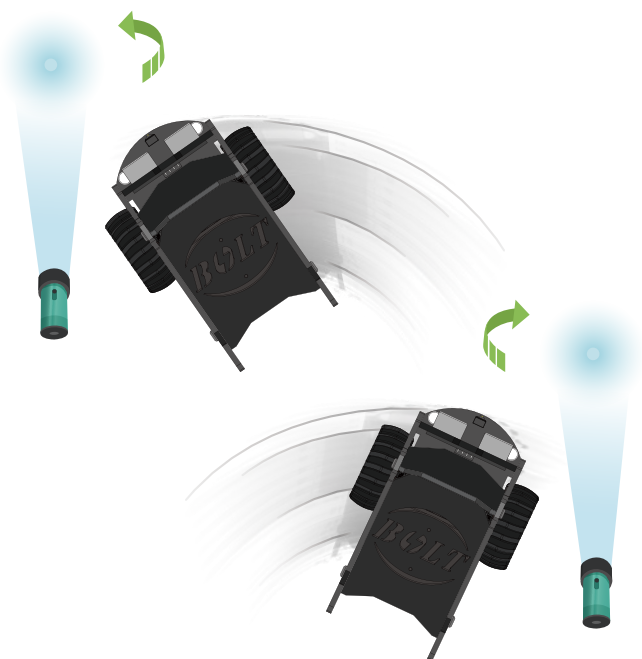
Smart Car Lights

Press the start button to control the on and off of the onboard RGB_LED by detecting the brightness of the ambient light, so as to realize the function of “turn off the light when it is bright, and turn on the light when it is dark”.



Lesson 6 - Light Chasing Robot

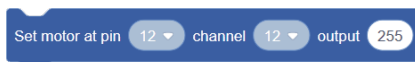
Press the start button, and use the flashlight to shine in front of the Bolt car. The car can distinguish the moving direction according to the light intensity to realize the effect of the light-chasing robot.



Knowledge

ESP32 ADC channels

ESP32 has two 12-bit ADCs with a total of 18 channels. Before reading the ADC data, the ADC must be set first.



How to get the data “800” and “2800” ?

Before the experiment, detect the light intensity in a normal environment, and record it, and use it as a standard value in the program for reference.

Program



Challenge

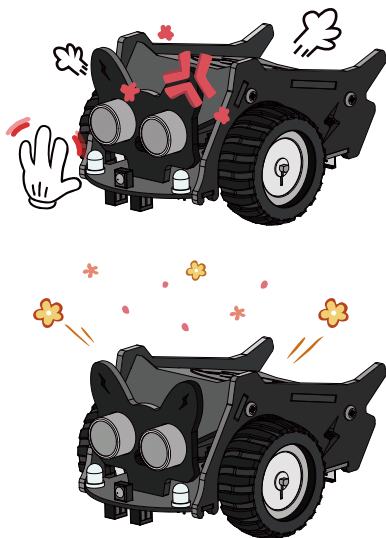
Avoid Searchlights

Press the start button, use the flashlight to shine in front of the Bolt car, the car will automatically avoid the light, and move in the opposite direction to realize the function of the car avoiding the searchlight.



Lesson 7 - The Angry Bolt

Press the start button, the serial port prints the distance value detected by the ultrasonic ranging sensor. When the distance is less than 20CM, the ultrasonic onboard RGB_LED will light up in red, and the buzzer will beep; otherwise, the RGB_LED will remain green.



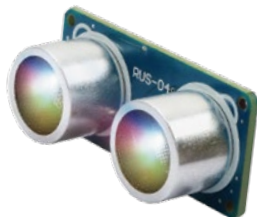
Knowledge

The working principle of ultrasonic ranging sensor:

The ultrasonic ranging sensor adopts the principle of ultrasonic echo ranging and uses the accurate time difference measurement technology to detect the distance between the sensor and the target.

Algorithm analysis:

It is known that the speed of sound "V" in the air at room temperature is about 340m/s, and the distance value can be calculated by the formula $S = V \cdot T / 2$ and unit conversion.



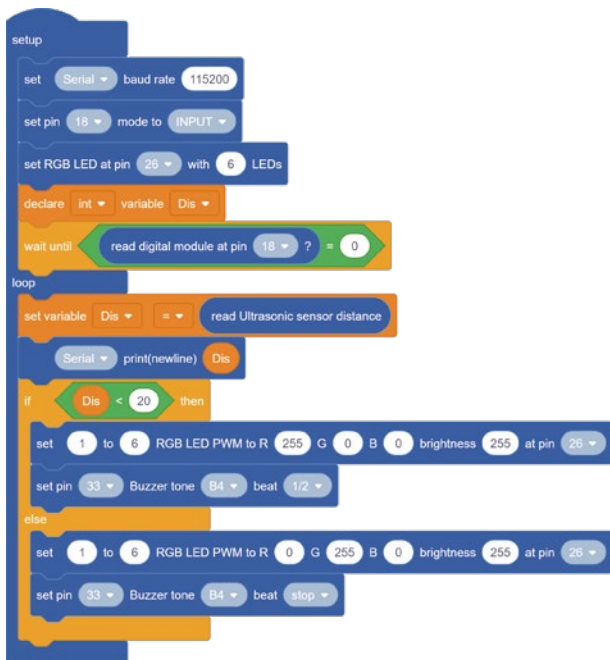
Character Type

Int: Integer refers to data without a fractional part.

float: Floating point refers to data with a fractional part.

declare float variable Dis

Program



Challenge

Color Of Emotion

Press the start button, and according to the distance measurement value of the ultrasonic sensor, the car displays different colors and actions.

0-10cm: angry (Red light + retreat); 10-20cm: happy (Green light + rotating); 20cm or more: sad (Blue light + motionless).



Lesson 8 - Obstacle Avoidance Robot

Press the start button, when the distance between the Bolt and the obstacle in front is less than 20cm, the car will turn right; otherwise, it will always keep moving forward.



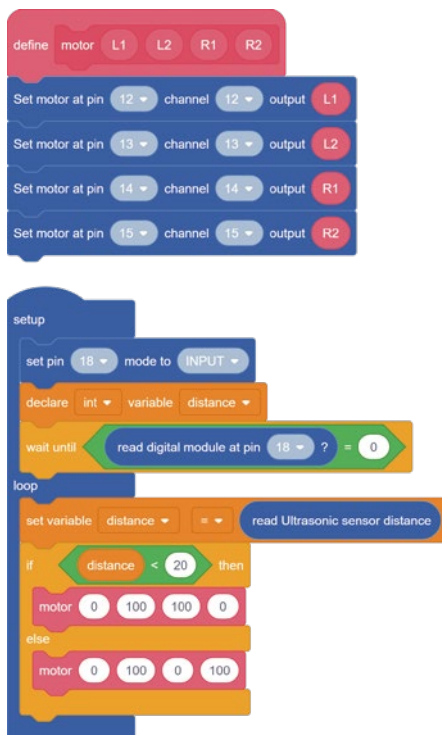
Knowledge

Ultrasonic and Infrasonic

The frequency of sound waves that we can hear is between 20 and 20000Hz, ultrasonic waves are higher than 20000Hz, and infrasonic waves are lower than 20Hz called infrasonic waves.

The ultrasonic waves that are common in our nature include wind, water currents, lightning, crustal movement, etc., which all contain ultrasonic waves, while infrasound waves are sea storms, volcanic eruptions, tsunamis, nuclear explosions, missile launches, etc. These can produce infrasound waves, both of which There is a common feature that humans cannot hear, but animals can hear, which is why animals are basically not harmed in the face of some natural disasters, because they can hear the sound waves from these earthquakes and tsunamis, and then escape asylum in time.

Program



Challenge

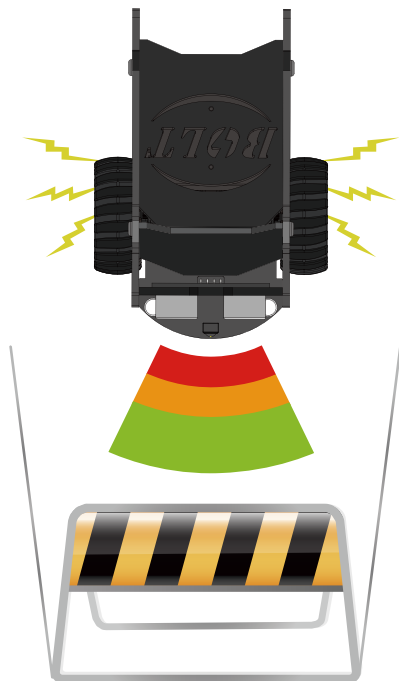
Intelligent Obstacle Avoidance

Press the start button, the car will move forward until it is less than 20cm away from the obstacle in front, the car will turn left and right respectively, and detect the distance once; by comparing the distance values in the two directions, choose the direction with the largest distance to move forward.



Lesson 9 - Reversing Radar

Press the start button, the serial port prints the distance value detected by the ultrasonic sensor. When the distance between the car and the obstacle in front is less than 30cm, the closer the distance is, the faster the RGB lights flash and the buzzer beeps; When the distance is less than 5cm, stop all actions.



Knowledge

Definition of Reversing Radar

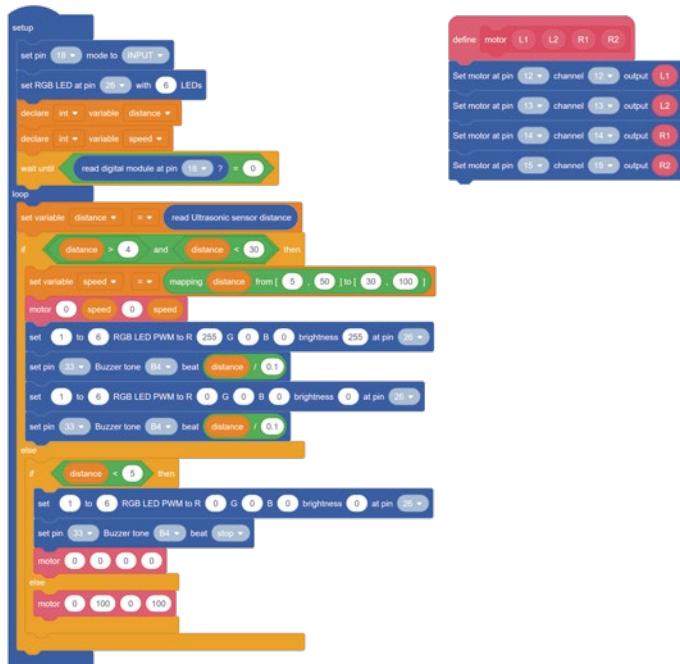
Reversing radar also known as "parking aid", is a safety aid when the car is parked or reversing. It can inform the driver of obstacles around it with sound or a more intuitive display. It relieves the driver's troubles caused by looking around when parking, reversing and starting the vehicle, and helps the driver to eliminate the defects of blind spots and blurred vision.

How to change the blinking frequency of lights?

Through the decrement of the ultrasonic ranging value, it is converted into the syllable duration of the buzzer, and then the flashing frequency of the light can be controlled.

distance / 0.1

Program



Challenge

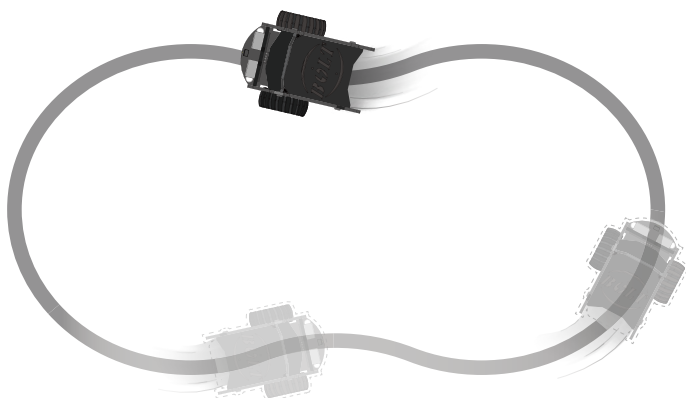
Ultrasonic Electronic Organ

Set a tone every 5cm in the distance range of 0~35cm. When the start button is pressed, the buzzer is controlled to emit different sounds by changing the distance between the ultrasonic sensor and the obstruction to achieve the effect of an electronic organ.



Lesson 10 - Tracking Robot

Press the start button, the car starts to follow the black line on the map, turn right when it deviates to the left, turn left when it deviates to the right, and back up when it exceeds the black line.



Knowledge

The programming logic of the tracking robot

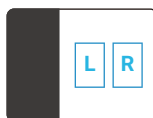
1. When only the probe on the left detects the black line, the Bolt performs a left turn;
2. When only the right probe detects the black line, the Bolt performs a right turn;
3. When the probes on the left and right sides do not detect the black line, the Bolt performs the backward action;
4. When the probes on the left and right sides detect the black line, the Bolt performs the forward action.



Left Turn



Right Turn

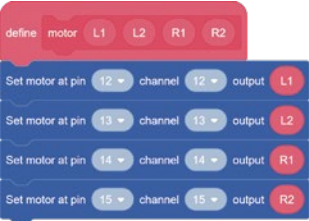


Backward

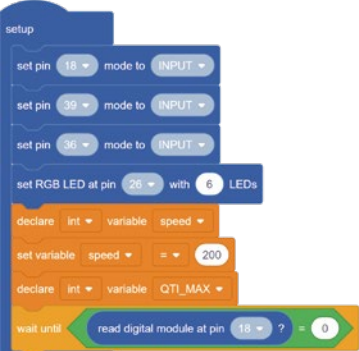


Forward

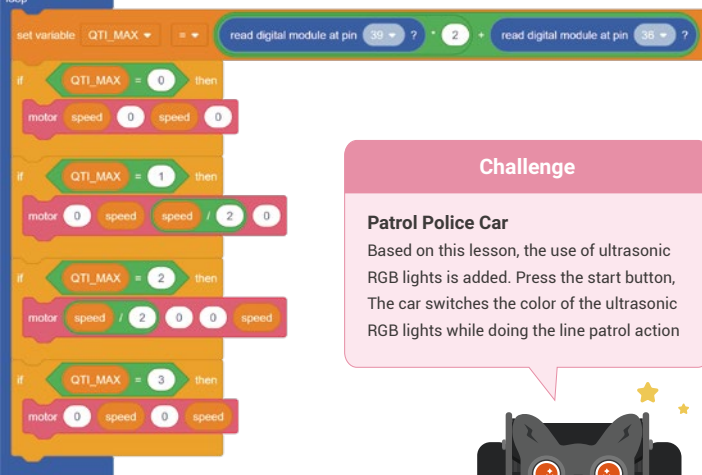
Program



```
define motor L1 L2 R1 R2
Set motor at pin 12 channel 12 output L1
Set motor at pin 13 channel 13 output L2
Set motor at pin 14 channel 14 output R1
Set motor at pin 15 channel 15 output R2
```



```
setup
set pin 18 mode to INPUT
set pin 39 mode to INPUT
set pin 36 mode to INPUT
set RGB LED at pin 26 with 6 LEDs
declare int variable speed
set variable speed = 200
declare int variable QTI_MAX
wait until read digital module at pin 18 ? = 0
```




```
loop
set variable QTI_MAX = read digital module at pin 39 ? * 2 + read digital module at pin 36 ?
if QTI_MAX = 0 then
  motor speed 0 speed 0
if QTI_MAX = 1 then
  motor 0 speed speed / 2 0
if QTI_MAX = 2 then
  motor speed / 2 0 0 speed
if QTI_MAX = 3 then
  motor 0 speed 0 speed
```

Challenge

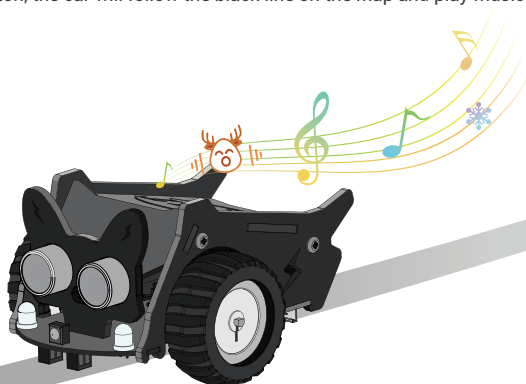
Patrol Police Car

Based on this lesson, the use of ultrasonic RGB lights is added. Press the start button, The car switches the color of the ultrasonic RGB lights while doing the line patrol action



Lesson 11 - Tracking Singing

Press the start button, the car will follow the black line on the map and play music along with it.



Knowledge

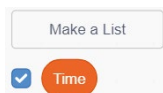
Line tracking sensor

The Line tracking sensor, that is, the infrared reflection sensor, emits infrared light through a white emitting diode. When the infrared light encounters a white obstacle or an obstacle with a brighter color, the infrared light will be reflected back and received by the black diode. When infrared ray encounters a black obstacle or an obstacle with a darker color, the infrared ray will not be reflected back.

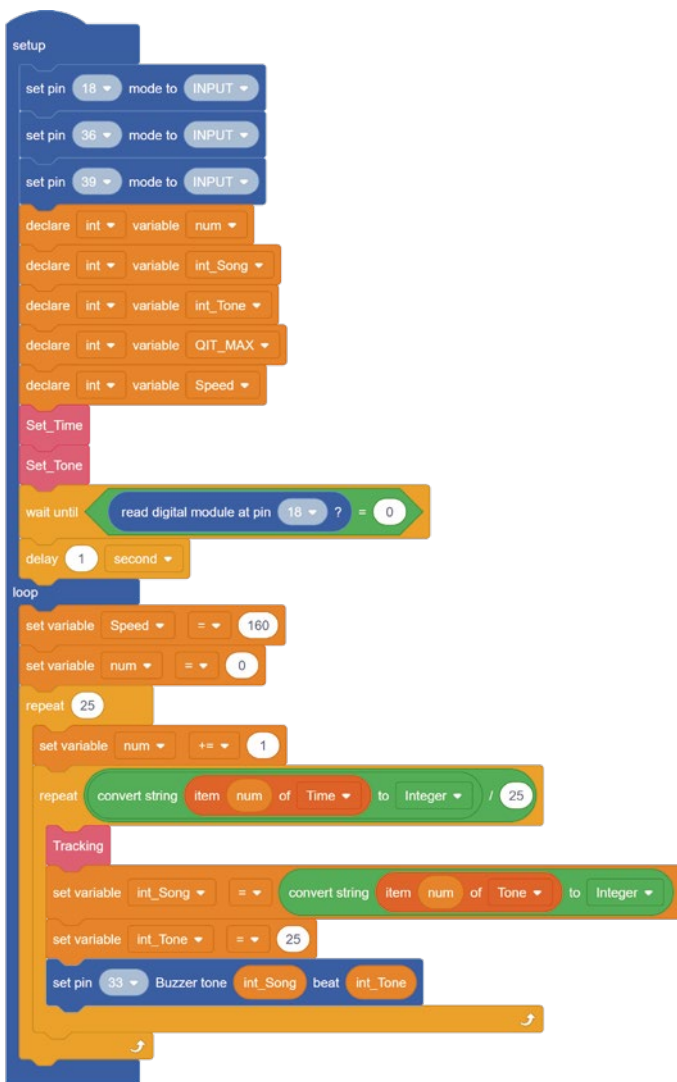


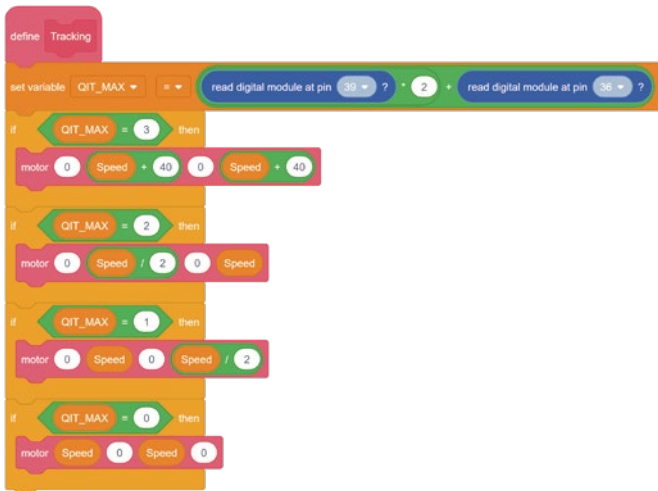
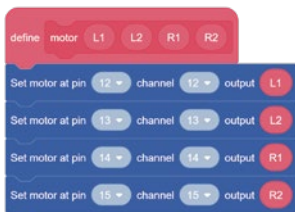
List

A list in a variable is a type of variable, but it defines a group of string variables of the same type.



Program





Challenge

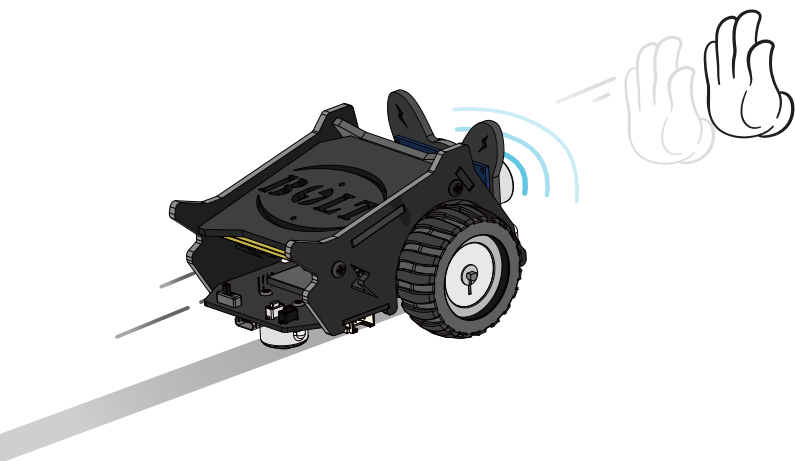
Tracking Obstacle Avoidance

Press the start button, and the car starts to follow the black line on the map. When it detects that the distance to the obstacle in front is less than 20cm, it stops moving, and controls the RGB lights to flash and the buzzer to sound.



Lesson 12 - Follow The Car

Press the start button, the car will follow the black line on the map, and adjust the speed according to the distance between it and the obstacle in front. When the distance is less than 5cm or more than 30cm, the car will stop.



Knowledge

The application of automatic following system

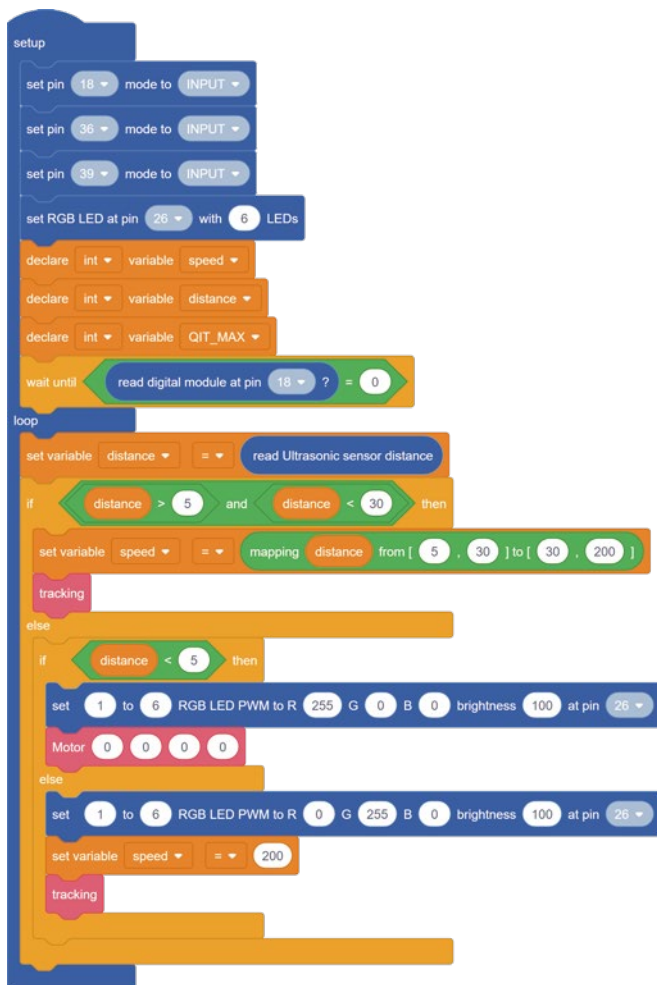
The automatic following system can be used to automatically follow suitcases, automatically follow shopping carts, automatically follow baby strollers, automatically follow sorting vehicles, etc. It has functions such as wireless following, anti-collision, anti-drop, loss alarm, etc.

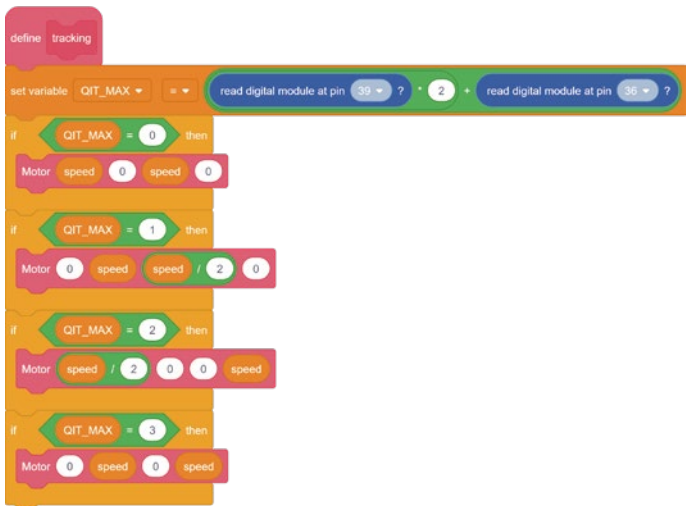
The working principle of the line-following car

The line-following trolley maps the ultrasonic ranging value to its speed value, and maintains the distance between itself and the moving target through this algorithm.



Program





Challenge

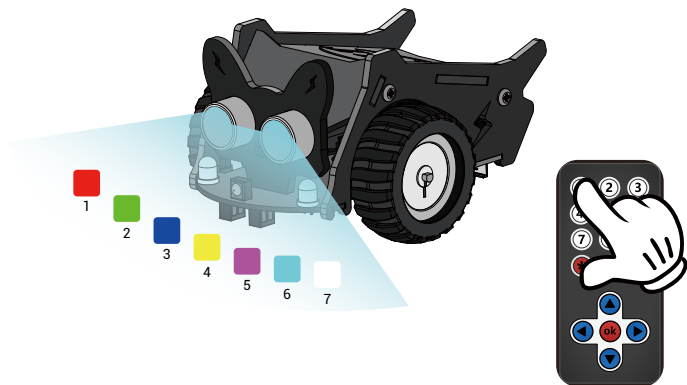
Light Chaser

Press the start button, control the car to follow the line with the flashlight, and map the light brightness value to the speed of the car. When the light is too bright or there is no light, the car will stop moving forward.



Lesson 13 - Infrared Remote Control Lamp

Press the start button and use the 7 digital buttons on the infrared remote control to control the ultrasonic RGB lights of the car to present different colors of light.



Knowledge

The working principle of infrared remote control

The IR remote control is used to generate the remote control code pulse, drive the Infrared emission tube to output the infrared remote control signal, and the IR receiver module (remote control receiver) completes the amplification, detection, shaping and demodulation of the remote control code pulse for the remote control signal.

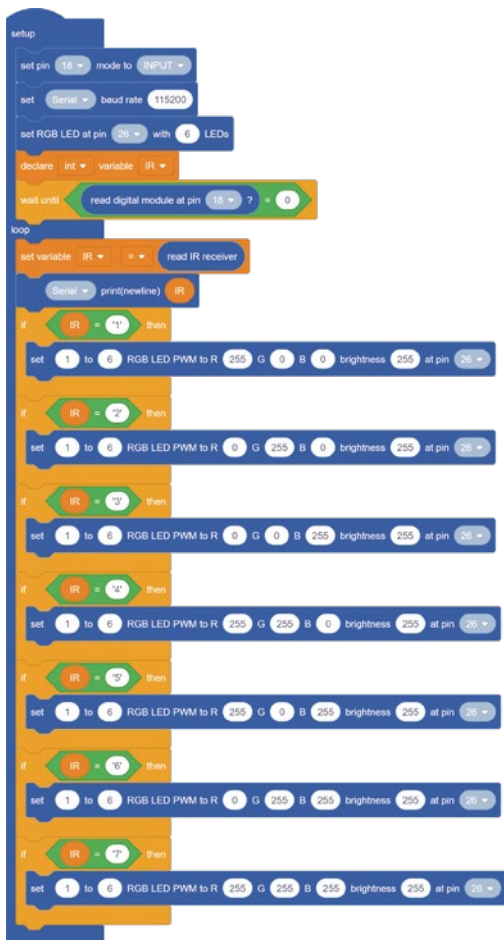


Char

The collective term for letters, numbers and various symbols in electronic computers or radio communications.

declare char ▼ variable IR ▼

Program



Challenge

Feature Upgrade

Press the start button, the four RGB lights of the car take turns to present different colors of light, and use the "up" and "down" buttons of the infrared remote control to control the speed of each RGB light switching.



Lesson 14 - Infrared Remote Control Car

Press the start button and use the "A", "V", "<" and ">" buttons of the infrared remote control to control the car to perform "forward, backward, left turn, right turn" movements.



Knowledge

Reading the key value of the infrared remote control

The defined variable "IR" is of different types, and the printed infrared remote control key values are also different. When inputting the judgment conditions, ensure that the data types are consistent, otherwise the code will report an error.

The difference between multiple if and if nested

Multiple ifs are judged from top to bottom. When the conditions are met, the statement body is executed; nested ifs are judged when the outer if conditions are established.

Program

setup

set pin 18 mode to INPUT

set Serial baud rate 115200

declare int variable speed

set variable speed = 255

declare char variable IR

wait until read digital module at pin 18 ? = 0

loop

set variable IR = read IR receiver

Serial print(newline) IR

if IR = 'M' then

motor 0 speed 0 speed

else

if IR = 'Y' then

motor speed 0 speed 0

else

if IR = 'e' then

motor speed 0 0 speed

else

if IR = 's' then

motor 0 speed speed 0

else

motor 0 0 0 0

define motor L1 L2 R1 R2

Set motor at pin 12 channel 12 output L1

Set motor at pin 13 channel 13 output L2

Set motor at pin 14 channel 14 output R1

Set motor at pin 15 channel 15 output R2

Challenge

Feature Upgrade
On the basis of the infrared remote control car project, the upgrade function: the number "1" turns on the ultrasonic RGB light, the number "2" turns off the ultrasonic RGB light, and the number "3" controls the buzzer to sound.



Lesson 15 - Remote Control Obstacle Avoidance

Use the infrared remote control to control the movement of the car, and the RGB green light is always on. When the distance between it and the obstacle in front is less than 10cm, stop moving, and control the RGB red light to flash and the buzzer to sound.



Knowledge

Automotive Driving Assistance System

Driving assistance system is an important part of the current international intelligent transportation system research. It uses machine vision and sensor technology to realize real-time notification of the driver's surrounding environment, and timely warn the driver to take effective measures and eliminate accident hazards when the vehicle may be potentially dangerous.

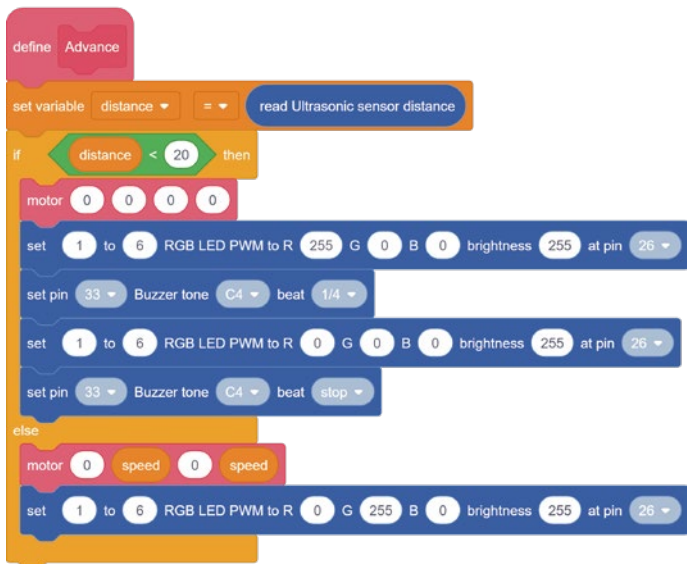
Status control flag

When the forward button is pressed, the flag variable is set to 1, and the obstacle avoidance mode is turned on. When the forward button is released, the flag variable is set to 0, and the obstacle avoidance mode is turned off; this ensures that when the car is less than 20cm away from the obstacle, it cannot continue to move forward. But you can still turn left and right.

Program

The program is written in Scratch and consists of several parts:

- Setup:**
 - set RGB LED at pin 26 with 6 LEDs
 - set pin 18 mode to INPUT
 - declare int variable speed
 - declare char variable IR_value
 - declare int variable distance
 - declare int variable state_value
 - wait until read digital module at pin 18 = 0
- Loop:**
 - set variable IR_value = read IR receiver
 - set variable speed = 200
 - IR_remote_control
- Define motor:**
 - L1 L2 R1 R2
 - Set motor at pin 12 channel 12 output L1
 - Set motor at pin 13 channel 13 output L2
 - Set motor at pin 14 channel 14 output R1
 - Set motor at pin 15 channel 15 output R2
- IR_remote_control:**
 - if IR_value = 'W' then: set variable state_value = 1
 - if IR_value = 'V' then: set variable state_value = 0; motor speed 0 speed 0
 - if IR_value = '<' then: set variable state_value = 0; motor speed 0 0 speed
 - if IR_value = '>' then: set variable state_value = 0; motor 0 speed speed 0
 - if IR_value = 0 then: set variable state_value = 0; motor 0 0 0 0
 - if state_value = 1 then: Advance



Challenge

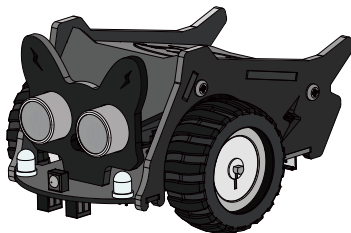
Feature Upgrade

On the basis of the main program, add the start and stop settings of the obstacle avoidance function. When the number "1" on the remote control is pressed, the obstacle avoidance function is activated; when the number "2" on the remote control is pressed, the obstacle avoidance function is turned off.



Lesson 16 - Comprehensive Application

Press the start button, and use the digital buttons "1", "2" and "3" on the infrared remote control to control the car to perform remote control, obstacle avoidance and line patrol respectively.



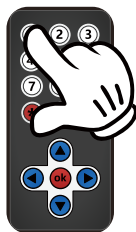
Remote control



Obstacle avoidance



Line patrol



Knowledge

Infrared applications:

1. Infrared switch

Passive infrared switches use the human body as an infrared source (the temperature of the human body is usually higher than the ambient temperature), and when infrared radiation is detected, the lighting is turned on.

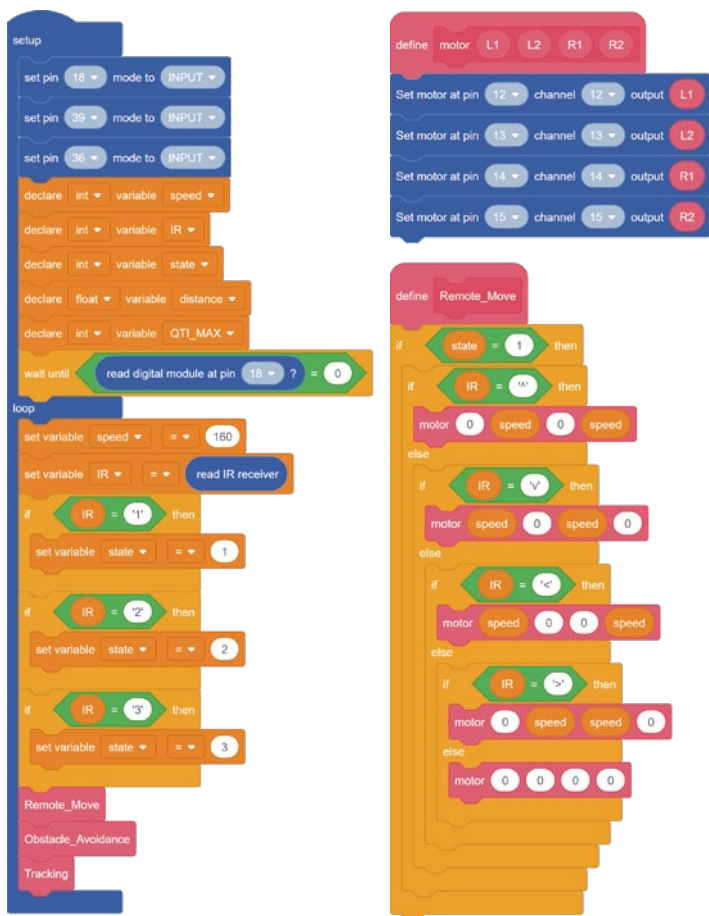
2. Anti-theft device

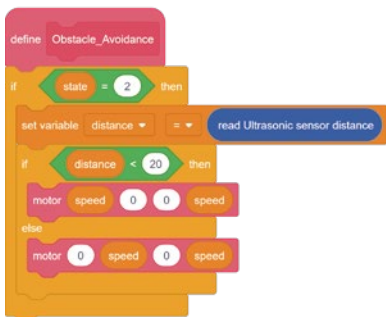
The infrared beams emitted by the infrared transmitters form an invisible blockade that will sound an alarm when someone crosses or blocks the infrared.

3. Infrared reconnaissance

Reconnaissance satellites carry infrared imaging equipment to obtain more intelligence information of ground targets, and can identify camouflaged targets and monitor military operations on the ground at night; and monitor military operations on the ground at night;

Program





Challenge

Feature Upgrade

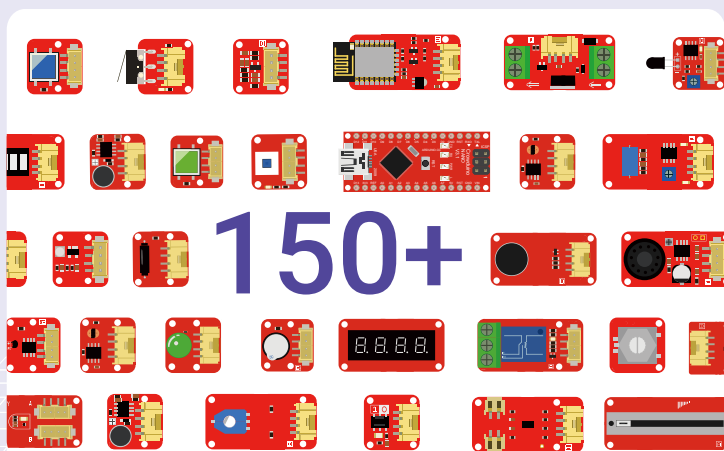
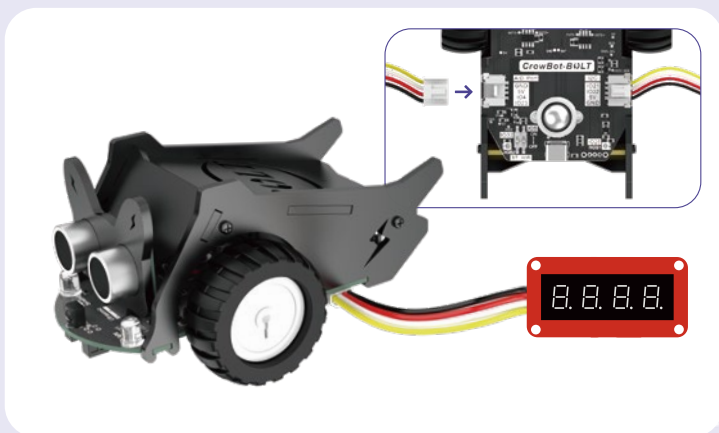
On the basis of the main program, the program control of digital button "4" is added. When the number "4" on the remote control is pressed, the trolley performs the movement of chasing light.



Learn more

The Bolt board also has two Crowtail module ports, allowing users to connect more sensors. We have 150+ Crowtail electronic modules which you can purchase from our website.

See the website wiki for more examples



Customer Service

If you have any questions, customer support is always stand by.



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Manufacturer: Elecrow Limited.

Address: 5F, Fengze Building B, Nanchang Huafeng Industrial Park,
Bao'an District, Shenzhen, China.

Support: techsupport@elecrow.com

Site: www.elecrow.com

