Chapter 7

Little Ranging Expert

We have known that Maqueen Plus is such a changeable robot with various functions, but more surprisingly, he can measure distance using his ultrasound eyes. With this buddy, you can say goodbye to your measuring tools.
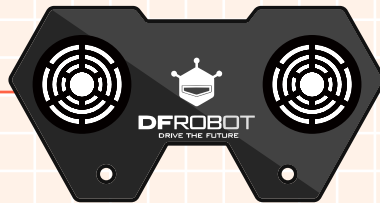
Goal

1. Get to know ultrasound
2. Learn the principle of ultrasound

Electronic Component

Ultrasound Brief

Ultrasonic sensor

The transmitter sends out ultrasound, and when hitting the object, the ultrasound reflects as echo and will be sensed by the receiver.

Command Learning

Block Brief

Read ultrasonic sensor

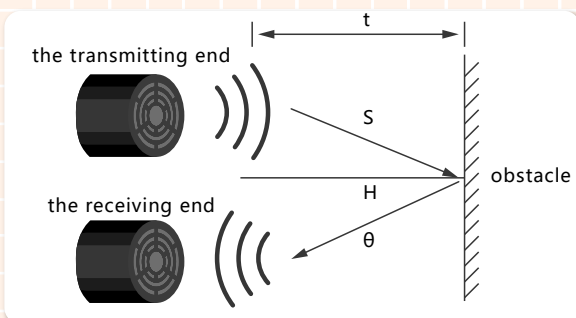read ultrasonic sensor T P0 ▼ E P0 ▼ cm

Read the value the ultrasonic sensor detects, unit: cm. (Preset the transmitter and receiver on the sensor)
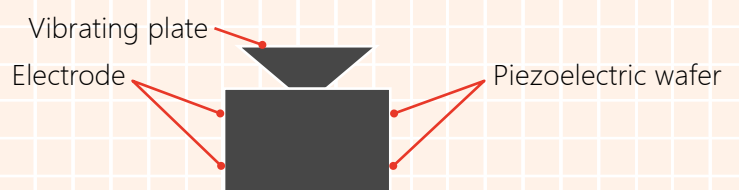
What is ultrasound?

As we know, when vibrating, objects produce sound waves. Some of them can be heard by human ears, while others cannot. Scientists named the vibrating times per second as the sound frequency with its unit named as Hertz. Almost all human beings are able to hear the sound frequencies ranging from 20 to 20000Hertz. Sound frequencies out of that range are inaudible to humans. For those sound, the scientists name it as "Ultrasound".

How does an ultrasonic sensor measure distance?

Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The sensors determine the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse.

the transmitting end

t

S

the receiving end

H

θ

obstacle

Ultrasonic sensors will convert the reflected sound into an electrical signal. A commonly used sensor consists of a piezoelectric wafer that can emit ultrasonic waves.
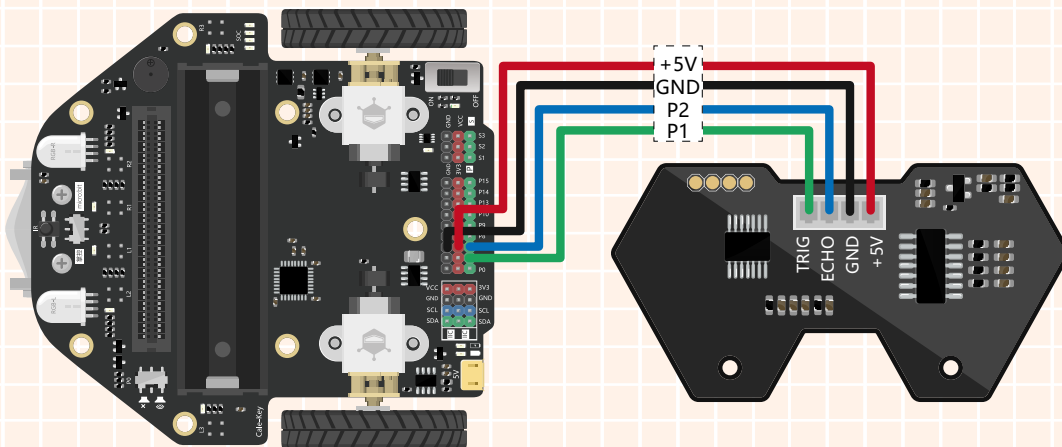
Vibrating plate

Electrode

Piezoelectric wafer

Hands-on Practice ✅

Hardware Connection:

The pin connection is shown below:

Step 1 Create a New Project

1.Input https://makecode.microbit.org/ into your browser to enter MakeCode editor.

2.Click "new project" to enter MakeCode programming interface.
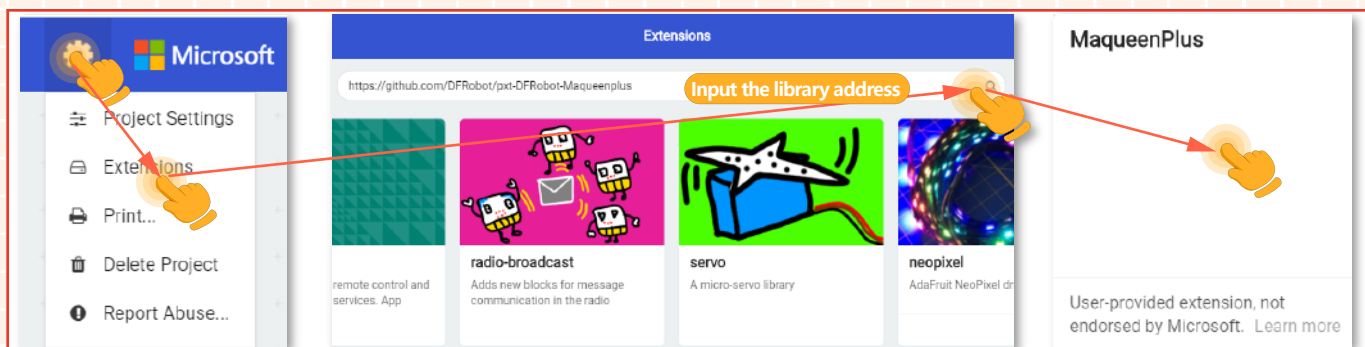
3.Add the Maqueen Plus library:https://github.com/DFRobot/pxt-DFRobot-Maqueenplus
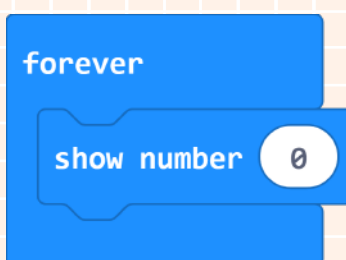
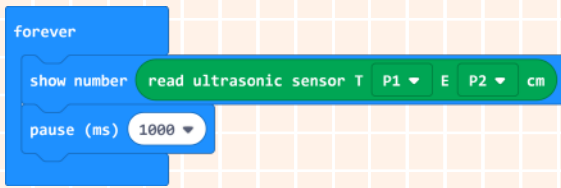

1.Enter MakeCode editor

2.Enter programming interface

3.Add the extension library

Step 2 Programming

1.Place the "show number" block into the "forever" block, shown as below.
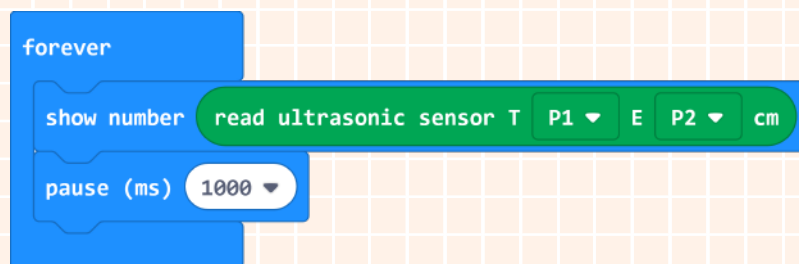
2.Put the ultrasonic sensor value inside the "show number" block to display the current distance. Add a "pause" block to prevent the serial reading the value too fast.
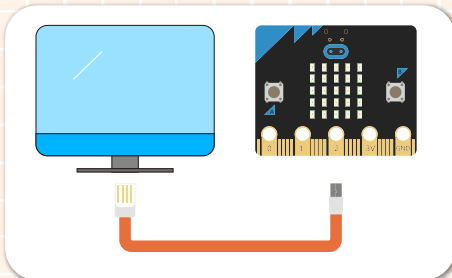

Knowledge Expansion

"T" is the transmitting end, corresponding to the "trig" on the ultrasonic sensor; "E" is the receiving end, corresponding to the "echo". On Maqueen Plus, trig is the P1, echo is the P2, so we need to set the pins in the ultrasonic block to P1, P2.
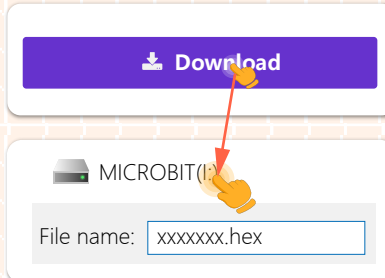
3.The entire program is shown below.

4.Name your project as "Little ranging expert" and save it.

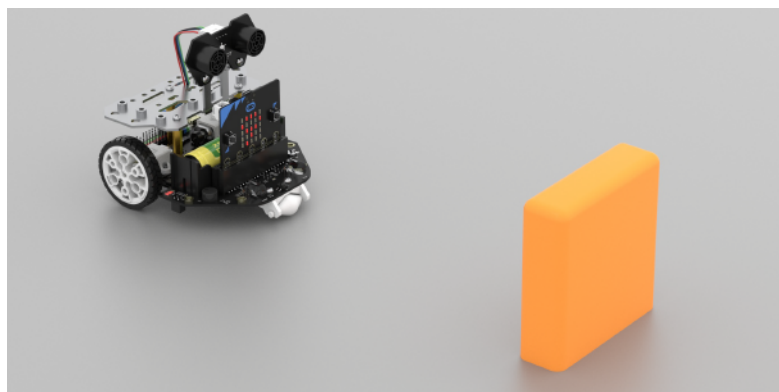## Step 3 Download Program

1.Connect to computer   2.Download program   3.Plug in micro:bit
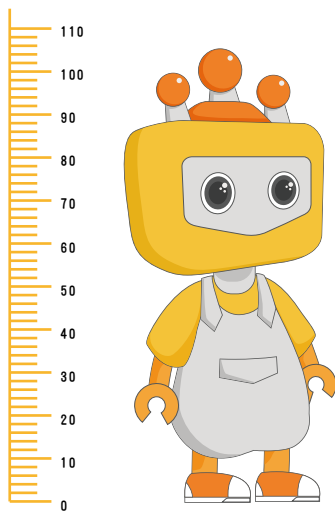
Step 4 Effect Display

Turn on the power switch, then we can use Maqueen Plus to measure distance. The detected distance will be displayed on micro:bit. We can use two different measuring ways to test the accuracy of Maqueen Plus. As shown below:

How to use an ultrasonic sensor to measure the height of a person?

To make the measurement more accurately, you have to:
Pay attention to the position and direction of the ultrasound.
Calibrate the sensor within 10cm to prevent large error.