

- Download the program to micro:bit to see what happens.

Result

When you press button A on the micro: bit, the matrix LEDs will show you the current temperature. When you press button B on the micro: bit, the matrix LEDs will show you the current humidity.



Note that because the microbit v2 version is still unstable, an abnormal -999 number will occasionally be displayed during the use of DHT11, which is a normal phenomenon



How to build a more comprehensive weather station so that we can get air quality, temperature, humidity, ultraviolet information and more?

Experiment 13 – Ultrasonic ranging smart door

Instruction

Do you remember the thinking problem in experiment 11 ? Did you find the answer? If you don't, rest assured that we will lead you to build such a smart, automatic door in this experiment. The only difference is that in this section we will use delicate and magical ultrasonic sensors.

Target

- Learn how ultrasonic ranging sensor works and use it to make a smart door with servo and buzzer.
- Learn how to get the distance from the ultrasonic ranging sensor.

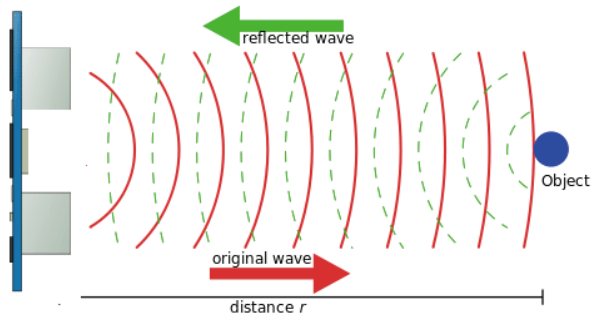
Required Parts

- Micro:bit x1
- Crowtail-Base shield for Micro:bit x1
- Crowtail-Ultrasonic Ranging Sensor x1
- Crowtail-9G Servo x1
- Crowtail-Buzzer x1
- Crowtail-Cable x2
- USB cable x1

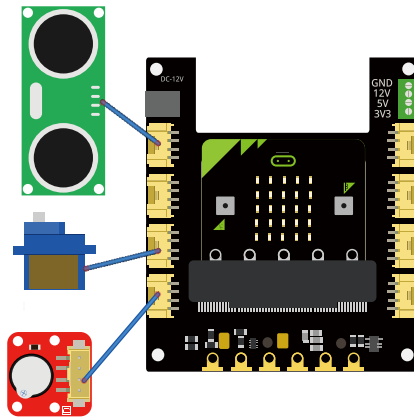
Hardware learning and connection

This HC-SR04 has stable performance and high ranging accuracy. The process of ultrasonic ranging: Ultrasonic pulses travel outward until they encounter an object, The object causes the wave to be reflected back towards the unit. The ultrasonic receiver would detect the reflected wave and stop the timer. Now read the time of the counter, which is the ultrasonic propagation time in the air. According to the formula: Distance = ECHO high level time X ultrasonic velocity (Speed of Sound in air 340m/sec) / 2, you can calculate the distance to the obstacle.





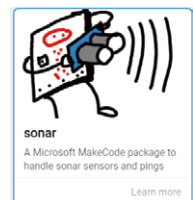
Connect Crowtail-Ultrasonic Ranging Sensor, Crowtail-Buzzer and Crowtail-9G Servo to P13&P15, P0 and P1 ports of Crowtail-Base shield for Micro:bit. **Note: You need to connect 12V power supply for the Crowtail-Base shield for Micro:bit.** The hardware connections are as follows:



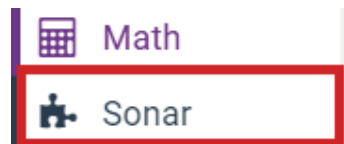
Programming and note

Just as Crowtail-Temperature&Humidity Sensor, we need to add the extension package for Crowtail-Ultrasonic Ranging Sensor before we use it. Follow the steps below to add extension package of ultrasonic ranging sensor:

- **Step 1:** Click on the Extensions, then search “sonar” in the search bar.



- **Step 2:** Add sonar package to your Makecode and you can see it.



- **Ping trig...echo...unit:** This block is inside the sonar package we added. We can use this block to get the time, distance in cm and distance in inches detected from the ultrasonic ranging sensor. In this experiment, we set the trig pin and echo pin of the sensor are P13 and P15 port of micro:bit. And the data we want to get is the distance in cm.

```

on start
  set distance to 0

forever
  set distance to ping trig P13
  echo P15
  unit cm
  if distance < 20 then
    servo write pin P1 to 180
    show string "Welcome!"
    pause (ms) 2000
    start melody power down repeating once
  else
    servo write pin P1 to 0
    pause (ms) 1000
  
```

- **Start melody repeating:** We use the **Start Melody Repeat** block to play a melody to remind the door is about to close, please be careful! When the melody ends, the door begins to close.
- **Download the program to micro:bit to see what happens.**

Result

When the distance detected by the ultrasonic sensor is less than 20 cm, open the door (the servo's shaft rotates 180 degrees), and the matrix LEDs of the micro:bit will display "Welcome". After 2 seconds, the buzzer will play a melody to warn that the door is about to close. Then, when the distance detected by the ultrasonic sensor more than 20 cm, the door start closing (the servo's shaft rotates 0 degrees).



How to apply ultrasonic ranging sensors to the car to make the car have an obstacle avoidance function?

Experiment 14 – Make an accurate clock

Instruction

Have you ever been late for school because you forgot to set the alarm clock? This is really embarrassing! Let's make an alarm clock with a RTC module together today, and say goodbye to being late!

Target

- Learn how RTC work and use it to make a clock with buzzer.
- Learn how to set time for RTC.