

Circuit 3B: Distance Sensor

Distance sensors are amazing tools with all kinds of uses. They can sense the presence of an object, they can be used in experiments to calculate speed and acceleration, and they can be used in robotics to avoid obstacles. This circuit will walk you through the basics of using an ultrasonic distance sensor, which measures distance using sound waves!

YOU NEED



RGB LED



3 330Ω RESISTORS



DISTANCE SENSOR

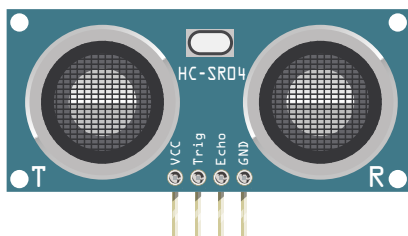


10 JUMPER WIRES

NEW COMPONENTS

ULTRASONIC DISTANCE SENSOR:

Distance sensors work by sending pulses of light or sound out from a transmitter, then timing how long it takes for the signals to bounce off an object and return to a receiver (just like sonar). Some sensors use infrared light, some use lasers, and some, like the HC-SR04 included in your kit, use ultrasonic sound (sound so high-pitched that you can't hear it).



NEW CONCEPTS

DATASHEETS: When working with electronics, datasheets are your best friend. Datasheets contain all the relevant information needed for a part. In this circuit, we are calculating distance based on the time it takes sound waves to be transmitted, bounce off an object and then be received. But, how can we tell distance from that information? The answer lies in

the datasheet for the distance sensor. In it, you can find the equation the program needs to interpret the distance. View the datasheet at <http://sfe.io/HCSR04>.

ELSE IF STATEMENTS: In the night-light circuit, you used an **if/else** statement to run one set of code when a logic statement was true, and another when it was false. What if you wanted to have more than two options? **Else if** statements let you run as many logical tests as you want in one statement. For example, in the code for this circuit, there is an **if** statement that flows like this:

1. **If** the distance is less than 10, make the RGB LED red.
2. **Else if** the distance is more than 10 but less than 20, make the RGB LED yellow.
3. **Else** make the RGB LED green.

To have four or five colors for different distances, add more **else if** statements.

Else if statements are different from nested **if** statements in that only one of the statements above can be true, whereas multiple nested **if** statements could be true.