

# Dyson Outreach Activity Report: Distance Sensor

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This Arduino-based activity required the pupils to complete the building of a "Distance Sensor" by implementing some functional lines of code to a mostly-completed file.

## 1 Setup

The hardware required for the task included an Arduino (Orange PIPs were used in the actual activity), An Ultrasound sensor (The HC-SR04 was used as it was readily available from the EIETL, and is easy to work with), two LEDs (one red, one green) and wires to connect everything up.

The circuit was designed and pre-built for the students, to avoid potential electrical problems arising from misuse, but also to allow them spend more time on the programming aspect. The Arduino IDE was also pre-installed.

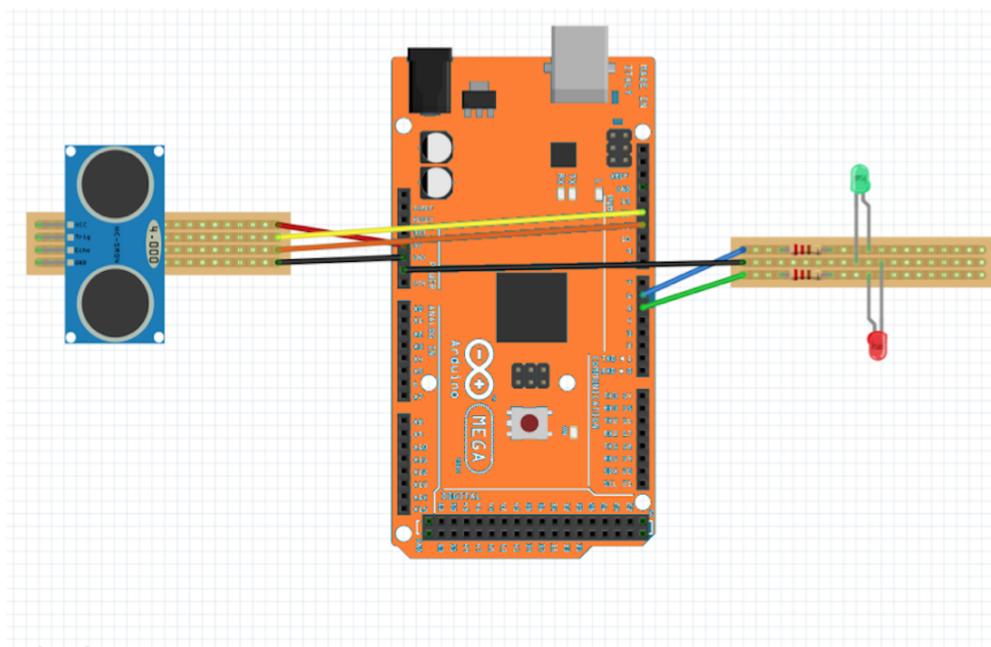


Figure 1: Setup of Hardware for Activity.

## 2 Activity Outline

The activity started with a short presentation. This was intended to familiarise the students with some context for the activity. It included an *Introduction to Arduinos*, which described what a Microcontroller such as the Arduino is, how it works and how to program it. The presentation also briefly described the sensor to be used, as well as some other project which have been done using Arduinos.

The pupils were then required to complete four tasks, which each required one or two lines of code. The tasks were as follows:

1. Calculate the distance from the time taken to read an echo.
2. Turn on the red LED when the measured distance is 20cm or less.
3. Vary the intensity of the red LED with the measured distance, so that it gets brighter as the measured distance gets smaller.
4. Also vary the intensity of the green LED, so that it gets brighter as you get further away (up to 80cm).

The last two exercises involved some mathematical manipulation to arrive at a suitable expression, but the pupils were guided through this in the handout.

## 3 Activity Retrospective

As this activity was shared between three people, it had a 90-minute slot to fill. As many of the pupils were taking GCSE Computer Science, they were more familiar with programming than expected, and the activity ended up being considerably shorter.

Since the activity consists of separate tasks, it already has a "modular" structure to it. To avoid ending up with too much time if this activity is reused in the future, it may be worth making more "modules" for the project, so that if the early finish happens again, they can continue with others. Some suggestions include:

1. Make the red LED blink repeatedly when the measured distance is 10cm or less.
2. Make the red LED blink faster as the measured distance gets smaller.
3. Make the green LED blink faster as the measured distance gets larger.