Can You See the Music?

Frequency Light Show!

Overview

Grades: 5-8
Time: 30 minutes
Subjects: Physics, Computer Science

In this code challenge create your own method of "seeing sound" using code, your knowledge of sound, and databot™'s LEDs!

Background

Sound travels in waves. The sounds we hear, high or low, can be "seen" using tools that visualize sound waves. Using the frequency program on databot™, it's easy to see the frequency of sounds you are hearing. Sound frequency corresponds to "pitch" or tone. So, the higher the frequency, the higher the pitch. Frequency is measured in cycles per second, or Hertz (Hz). Adult humans have a normal voice range from 85 Hz to 255 Hz. Children will have a lower range.

Objectives

Understand:
- That sound is transmitted in waves.
- A microphone (sound sensor) vibrates from sound waves and converts this vibration to electrical energy.

What You'll Need

- databot™ + Arduino IDE

Prep

- Open the databot™ frequency sketch for the Arduino IDE and "Save As" your own program.
- Review the code in the Sketch. Look for where it is reporting "frequency" for display.

Code Challenge (25 mins)

- Upload the frequency sketch to databot™ and run it.

- Look at the frequency range being output as you talk into the databot™ microphone. *You can use the Serial Plotter or Serial Monitor to view this data.*
- Now hum the "C" scale to databot™ and note the frequency range of your hum. *You will need to know this to create a working solution. Use the table format shown here or create your own to keep your data organized.*
- Your coding challenge is to modify this sketch in a way that databot™ can visualize the frequency range it is hearing using its LEDs.

For example, if you are humming at 100 Hz, you might divide all frequencies by 100, then use that number to blink databot™'s LEDs at that rate. If the LEDs blink once per second, you can easily multiply that by 100 in your head and you will know you are humming at 100 Hz! Note: You need to divide the frequency to get a realistic number for flashing. You can't see something blinking 100 times per second!

- Demonstrate your code and solution to your instructor and classmates. *How accurate is your frequency reader?*
      How could this hardware / software solution be useful in the real world?

Educator Info

This is an intermediate challenge for coding as students will need to know how to store values in variables and manipulate them with mathematical operators. They will then use the resulting values to determine the blink rate for the databot™ LEDs.