Sound

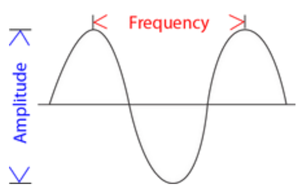
databot™ Sensor Starters

Meet the Sound Sensor

databot™'s sound sensor is an omnidirectional MEMS (Micro Electrical Mechanical System) microphone that sips low amounts of power while converting sound waves to digital data. As a multipurpose microphone, it is used in a number of consumer and business-type applications including smartphones, teleconferencing systems, video cameras, and more.

What Does it Measure?

The sound sensor measures sound intensity. Sound intensity is what we typically think of as "loudness." If you look at an illustration of a sound wave "amplitude" corresponds to intensity. The higher the amplitude, the louder the sound!



How Does it Work?

A MEMS microphone works on the principle of a pressure-sensitive membrane that is mounted to a silicon wafer. The pressure of the sound waves is transmitted by the membrane to the chip and converted to electrical signals.

What Are the Units for Sound?

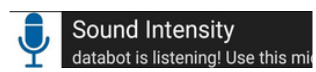
Sound intensity is measured in units called decibels. The decibel scale is logarithmic, which means doubling the decibel units does not double the output, it can increase as much as 100 times!

Decibels (dB)	Common Sound
60 dB	Normal conversation.
30 dB	Soft whisper.
85 dB	lawn-mower.

Grades: 6 & Up
Time: 15 Minutes - PDQ 1 & 2
Subject: Physics, Technology
Topics: Sound, Sound Intensity, Decibels, Amplitude

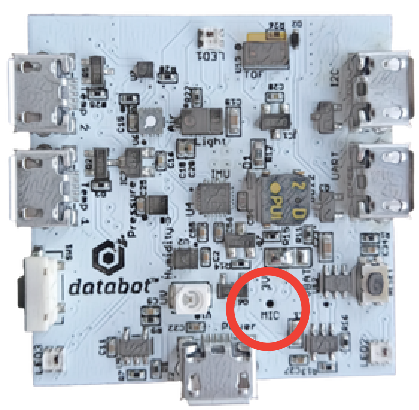
What You Will Need/Prep

- databot™ 2.0 & a smart device (iOS or Android).
- Read the Vizeey™ Fast Start Guide and install Vizeey™ if you haven't already.
- Scan the QR code for Sound Intensity if you don't have it already.



Where Does it Live?

The sound sensor is a bottom-mounted sensor so it is on the other side of the PCB. However, it needs a hole for sound to enter. Look for the label Mic on your databot™!



Important Terms

Sound: Continuous vibrations that travel from one medium such as air or water to another.

Sound Intensity: Intensity is determined by two factors: 1) the amplitude of the sound waves; and 2) how far they have traveled from the source of the sound.

Amplitude: The strength or level of sound pressure.

PDQ1 : Etch a sketch with Sound!

Sound

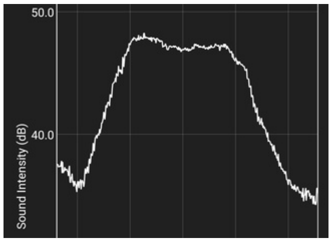
Prepare to experiment with your **sound** levels and watch the image that is generated by the graphic display. Can you draw shapes with the **sound** of your own voice? Let's explore and find out!

1. Tap on **Sound Intensity** in Vizeey™ to load the experiment & use these icons to start and pause the experiment:
2. Begin the experiment and do some free form **sound** trials to see how **sound intensity** affects the display. Try different orientations with your device and try expanding the display until you have a display you are comfortable with.
3. Challenge 1: Control your voice and **sound** such that your data draws a round mound.
4. Challenge 2: Holding the same **sound intensity** will display a flat line. Draw square waves by varying your **sound intensity**.
5. Challenge 3: Create triangular spikes in your display by varying your **sound intensity**.

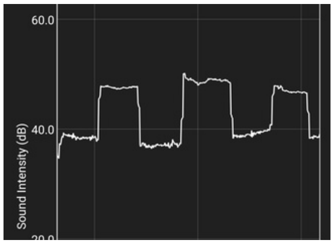
Now, with your new found skills in drawing with **sound**, create an original drawing that is recognizable by others. Good luck!

Increase your voice to increase the ***amplitude***

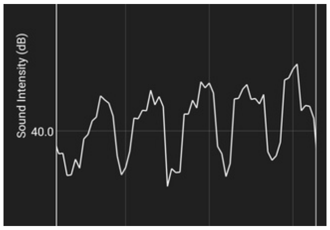
Decrease your voice to reduce the ***amplitude***



Round mound



Square waves

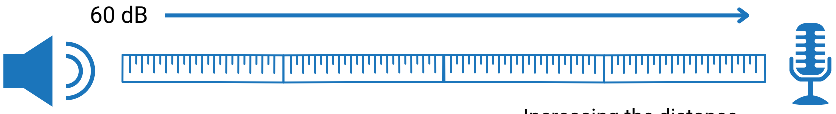


Triangular spikes

PDQ2 : Sound Intensity Vs Distance

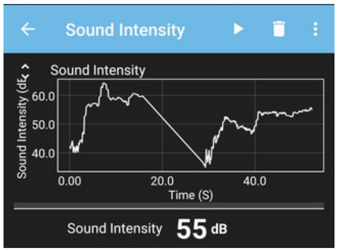
In this PDQ, use the **Sound Intensity** experiment to visualize how **sound intensity** varies as you get closer or move farther away from the source. Record the distance required to achieve a dB level of 60, 55, 50, and 45. Can you predict the sound level at a particular distance based on your experimentation? Test your hypothesis and record your findings.

1. Tap on **Sound Intensity** in Vizeey™ to load the experiment & use these icons to start and to pause the experiment:
2. Devise a constant sound source like a tone generator app on a phone and lay out a tape measure. Set databot™ on the measure at a distance that records an intensity of 60 dB.
3. Move databot™ away from the sound source to reduce the sound intensity to 55 dB. Note the distance.
4. Move again until the sound intensity reads 50 dB. Note the distance on your tape.
5. Predict the distance required to achieve 45 dB. Now move databot™ to that point - were you successful in your prediction?

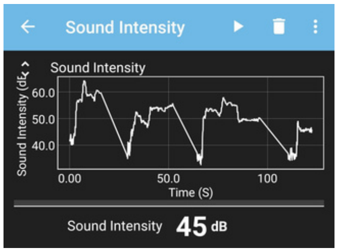


Sound source with constant intensity.

Increasing the distance decreases the **sound intensity**



At what distance do you achieve 55 dB?



At what distance do you achieve 45 dB?