

Telephone

You have probably made that classic device, the string and cup telephone. But, do you know which type of cup works best? Which type of string? How taut you should pull the string? To find out, we will use a sound sensor to test different telephones.

Making a string-and-cup telephone:

1. Use a toothpick to punch a small hole in the bottom of a paper cup.
2. Push one end of a three-meter-long piece of string through the hole.
3. Tie the end of the string around half a toothpick to keep it from pulling through the hole.
4. Attach a second paper cup to the other end of the string the same way.
5. Have one person hold one cup to his/her ear.
6. Pull the string taut.
7. Have the other person talk into the other cup.

Testing your telephone:

Team up with another group. One group will use its NXT to log the sound sensor to test the decibel level at one cup. The other group will turn its NXT into a sound generator to play a tone into the other cup.

As you run the tests, think about how you can keep all of the variables the same except the one you are testing. String length, sensor placement, background noise: there are a myriad of factors to consider.

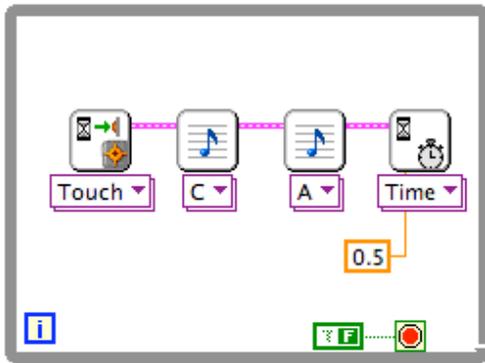
Programming the sensor data-logger: Write a program to log the sound sensor, writing the values to the red data set.



To set the parameters for data logging, right-click (control-click on a Mac) on the lower left corner of the Log Red Dataset and choose Create Constant. The top parameter is the sampling rate; the bottom parameter is the total logging time.

Programming the tone generator: Write a program to generate a tone. You will not need to plug anything into your NXT; you will use the built-in speaker to generate the tone.

The program below waits until the touch sensor is pushed, then plays two notes, a C and an A, waits one-half second, then repeats.



Running the test:

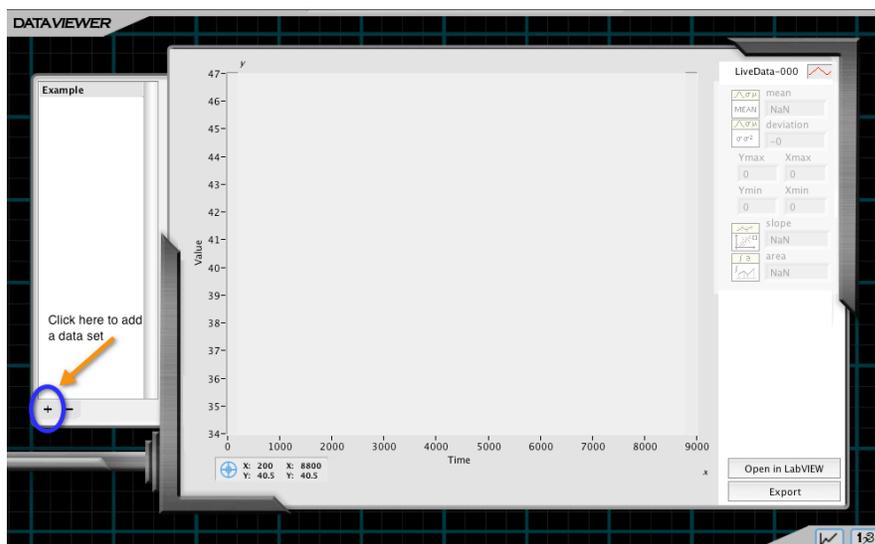
Plug the sound sensor into port 2 and download the program. Tape the sound sensor inside the cup you are testing. Remember that you want to control for as many variables as possible, including being consistent about where in the cup you place the sensor.

To gauge the level of background noise (and to do a test of your data-logging program), you may want to run the logging program once without the tone generator.

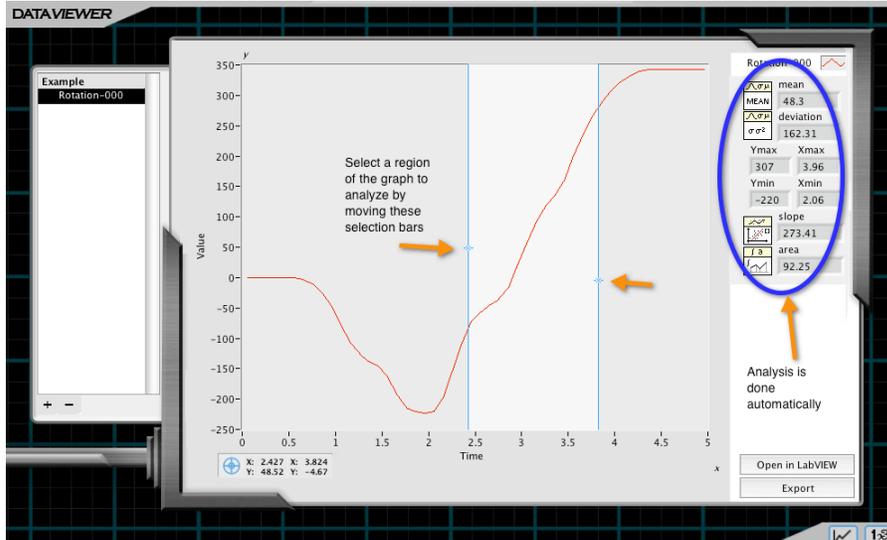
Uploading the data:

After you have run the test, you will need to upload the data to the computer. Here's how: On the drop-down Tools menu, choose NXT Applications, and then choose Data Viewer.

On the left-hand side of the Data Viewer, you will see a space for listing data sets. Click on the plus sign at the bottom to add a new data set. You will see a picture of the NXT with the red dataset icon highlighted. Click on the icon and the dataset will be uploaded to the viewer.



Once you have uploaded your data, you can use the Data Viewer to analyze them. The mean, maximum, minimum, and other statistics are displayed to the right of the graph. If you wish to look at only some of your data, you can select a section of the graph to analyze.



Telephone Extension

Use your telephone to make a musical instrument by connecting decibel ranges to particular pitches. A template program will be provided for you.

Can you play a tune by tapping the cup or plucking the string with varying intensities? How about running your fingers along the string?

Can you make a multi-stringed instrument by varying the tension of the string or using more than one type of string?

Sound Science
STREAM 2010

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