

## Lesson 3: Exercises

### Learning goals

- Fundamentals of speech production (recap): phonation and articulation
- Various ways of taking measurements from sound in Praat
- Visualizing and measuring fundamental frequency / pitch
- Drawing and plotting in the Picture window
- Praat scripts: History

### Exercises

1. Read/Watch the material *How does pitch analysis work?*
2. Make sure that you know how to find the internal manual pages (**Help**) about acoustic analyses in Praat (see, e.g., the keywords **Pitch**, **Spectrum**, **Spectrogram**, **Intensity**). In Praat, the manual can be accessed in almost all windows under the Help menu or button. Take a look at the manual and/or Praat website and try to find out what kinds of acoustic analyses are available in Praat.
3. In Praat, open a sound file and the corresponding TextGrid file – preferably the same files you worked with in the previous lesson. Open a TextGrid editor with the sound and the TextGrid. Switch on the spectrogram, the pitch curve, and the intensity curve. Switch off the formant analysis in case it is currently displayed.
4. If required, adjust the pitch analysis settings in the editor window, in order to make them more appropriate for the speaker in question (**Pitch:Pitch settings...**).
5. In the TextGrid editor, change the displayed scale of the pitch curve so that the peaks and troughs are clearly visible (**Pitch:Advanced pitch settings...**).
6. Until now, we have practised annotating time intervals in Praat. Just for fun, you could also try inserting and using a PointTier in the TextGrid you are editing in Praat. Add a PointTier (**Tier:Add point tier...**) and call it “peaks”.
7. In the TextGrid editor, locate the highest peak on the pitch curve. You can find the peak first by visually inspecting the display. To locate the exact time position of the highest point, you can select an area around the peak and use the command Pitch: Move cursor to maximum pitch. Now, let’s try inserting a Point annotation in the new PointTier you just created, at the time of the pitch maximum. You can also add a label to the point (you can call it “max”, for instance). In order to find out the exact pitch value at the peak, select **Pitch: Get pitch**, and Praat will give you the frequency in Hertz (or the relative pitch in another scale, depending on what the current pitch display preferences are, see *Unit* under **Pitch: Pitch settings...**). Save the TextGrid again.
8. In a similar fashion, practise taking measurements from the *Intensity* curve. You do not need to annotate everything in the TextGrid, of course; but make sure that you

know how to copy the measured values into another program, for instance to a Word document.

### Using a log file

9. You should now remember how to query individual measured values in the Sound editor window or in the TextGrid editor, in order to see the numbers in the Info window in Praat. You know how to measure pitch or intensity at a selected point in time (given that your sound file is suited for this purpose and the analysis settings are adequate). You also know how to measure the duration of a selected time span (interval) in the sound file.
10. In case you need to make a lot of similar measurements in the Sound editor or in the TextGrid editor, you can use a so-called log file, where the measured values from the selected time position can be stored with just one keystroke. For instance, you may wish to create a simple tabulated text file that can be opened in Excel or in a statistical program for further analysis. Let's try this!
  - Open a sound and a TextGrid file in the TextGrid editor, in the usual way.
  - Select **Query: Log settings...** In the form dialog box that opens, you can define what happens each time you select the command **Log 1** under the **Query** menu.

After *Log file 1*, you need to provide the full and exact path to the text file where the measured data should be saved. **Note that the default path might not work on your computer!** Look up the directory path and copy it carefully. (Note also that the log command will fail unless you have writing privileges to the specified directory.)

At the end of the path, you must also insert a name for the file, for instance *mylog.txt*. The file does not need to exist yet – Praat will create it if required. If you only provide a file name and exclude the file path, Praat will try to save the log file to the same directory where the Praat application program is located. (Try this if all else fails!)

After *Log format 1* you give the format in which the measured values are to be saved, at each key press. You can try including different measurements. The “placeholders” for each measurement must be provided in single quotes, for instance. 'dur' will measure the duration of the currently selected time span. Check out the internal manual in Praat in order to discover other values that can be logged (click on Help and see “Loggable values” on the manual page).

- After setting your preferences, click **OK**. Now, click somewhere in the sound signal or select a brief portion of the sound, and then select **Query:Log 1** or just hit **F12** on your keyboard. The row of values measured from the selected position will show up in the Info window, and the same line will also be appended at the end of the log file. Convenient, isn't it?

Similarly, you can also set up an alternative log file (**Log 2**), and you will have two keyboard shortcuts for taking measurements.

11. NB. When using the Log commands, all the analysis displays must be visible in the editor window! Otherwise, you will end up with nothing but missing values. The log file settings will remain on the same computer until you change them.

*Tip: It is advisable to define the row of data in Log settings so that the measured values and other adjacent fields of data are separated by a tab character, for example. This way, your measurements will be saved in a text file with a fixed format, and you can easily import the file into a spreadsheet program or a statistical program where the measurement results can be further processed and analyzed.*

### **Saving the Info window**

12. If you like, you can also save the contents of the Info window into a text file. Try it!

### **Drawing and painting in the Picture window**

13. From the Sound object you were viewing, create a Pitch object via the Object window in Praat. Make sure the Sound object is active, and select **Analyse periodicity: To Pitch...** Next, you will need to provide the settings for pitch analysis. It is best to apply the same settings you have found reasonable by inspecting the pitch curve for the same sound via the sound editor. Note that the Pitch object can also be conveniently generated from the editor window. Make sure that the pitch curve is visible (**Show pitch**) and that its settings are defined correctly. Zoom in on the desired portion of sound. Then select **Pitch: Extract visible pitch contour**, and the Pitch object corresponding to the visible piece appears in the object list.
14. Read the material *Creating pictures*. Try drawing images of different sizes and shapes in the Picture window from the Pitch object you just created. Try plotting the curve in red color, for example. Save one of the pictures for yourself. Try inserting the saved image into, e.g., a Word document. Also try to paste the image into a Word document directly from the Praat Picture window using the copy / paste method (this only works on the Windows and Mac versions of Praat).

In the editor, the visible pitch curve can also be directly plotted to the Picture window by selecting the command **Draw visible pitch contour...**

15. In the Pitch curve you just drew, try adding a mark to the point where you recently measured the highest value of the fundamental frequency. In the Picture window, select the **Text...** command in the **World** menu if you want to insert text in the middle of the image, just above the pitch peak. In this case, enter the exact time point from which you took the measurement as the Horizontal position value (you can visit the TextGrid window to check this). In Vertical position, you enter a value that is slightly higher than the fundamental frequency you measured. In the Text field, you can enter, for example, the rounded pitch value as the label for the mark. Press **OK**.
16. Try to find out which features of the voice are associated with *jitter* and *shimmer*, or what those values can be used for. Find out in the Praat internal manual how jitter and shimmer can be measured with the Praat program.

## More about Praat scripts: The History function

Try creating some script code with the History function in Praat:

1. Close Praat and reopen it.
  2. Open a sound file in the object list.
  3. Calculate, for example, the fundamental frequency analysis of the sound object via the object list (with the **To Pitch...** button; there is no need to worry about the analysis settings now).
  4. Use the **To Spectrogram...** button in the object list to calculate the spectrogram of the sound object.
  5. Use the Paint button to draw the spectrogram object in the Picture window.
  6. In the Picture window, select a new drawing area below the spectrogram with the mouse. Draw the Pitch object (eg **Draw (speckle)...**)
  7. In the drawing window, select the area that contains both the spectrogram and the fundamental frequency curve you are drawing. Save the image to a PNG file, for example.
  8. Now create a **New Praat script** from the **Control** menu in the object list and select **Paste history** from the **Edit** menu in the Script window. All the things you just did with Praat will be shown as scripting language commands! Compare the lines of the script you created with the menu commands and buttons you used in the previous sections. Why are there three numbers after the **To Pitch** command in the script? And where do you think the parameters after the **To Spectrogram** command in the script come from?
17. Clear the Edit window (**Edit: Erase all**) and remove all objects from the object list (select all objects and press **Remove**). Then try running (**Run:Run**) the script generated by the history function. Praat automatically repeats everything you just did yourself! Well done!
- Finally, in case you are not familiar with articulatory phonetics and have some spare time, I recommend watching these videos:
    - [Evan Ashworth / Ubc Visible Speech: Introduction to Articulatory Phonetics \(Consonants\)](#)
    - [Evan Ashworth / Ubc Visible Speech: Introduction to Articulatory Phonetics \(Vowels\)](#)
    - [Evan Ashworth / Ubc Visible Speech: Introduction to the International Phonetic Alphabet Verkko-osoite](#)