

1. Separate signals by filtering

Open the signal “mix.wav” with Praat. It contains a mixture of two audio signals that belong to different frequency bands, so they can be separated by filtering. Listen to the original signal to check what are the sounds mixed in it.

Observe the spectrogram where you would see the two signals that compose the mix. One of them is composed by a combination of three tones (and harmonics) and it is situated mainly in low frequencies. The other is placed in high frequencies. Select the suitable spectrogram settings in order to see the narrow band spectrogram. Which are the approximate values of the fundamental frequencies of the three tones? How many harmonics of them do you see in the signal?

To separate both signals we have to apply two filters. Select the Sound object in the Praat Objects list and press Filter, selecting a pass Hann filter, as show in Figure 1. Select the suitable band to retain in the output signal by changing the “From frequency” and “To frequency” values and press Apply.

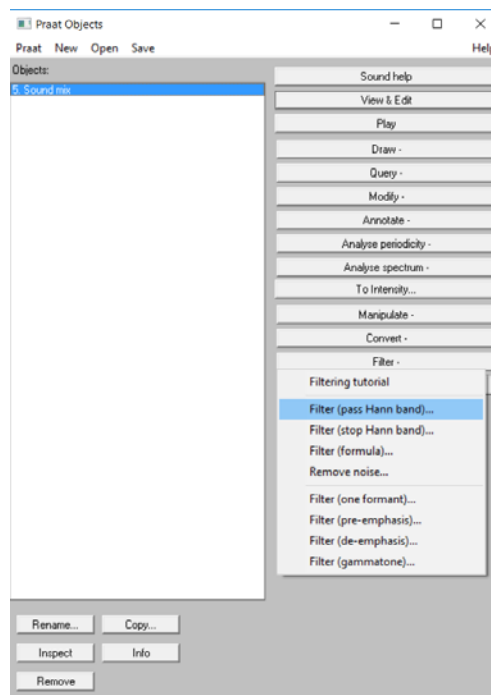


Figure 1: Choosing a filter in Praat

A new object with the filtered signal will be available in the Objects list. You will have to design one filter for each of the two signals that compose the mix. Play with the frequency boundaries of the filters until you separate both signals properly. Which values have you used to get the lower band signal? And for the higher band signal?



2. Remove noise by filtering

Open the signal “noisy_signal.wav” with Praat. Listen to the signal and see its spectrogram. The signal is composed by an audio signal masked with high power noise. Identify the band where the noise is placed by looking at the spectrogram. Which is the frequency that separates the signal from the noise? As the noise has much more intensity than the signal, you may have to play with the “Advanced spectrogram settings” in order to see both the signal and the noise properly. Try unchecking the “Autoscaling” checkbox and adjusting the value of the “Maximum (dB/Hz)” parameter.

Once you have determined the value of the frequency that separates the noise from the signal, design an appropriate filter to retain the signal and apply it. The signal you recover may be too weak to be heard. If this is your case, you can amplify it by selecting the filtered signal in the Objects list and pressing “Multiply” inside the “Modify” menu, as shown in Figure 2.

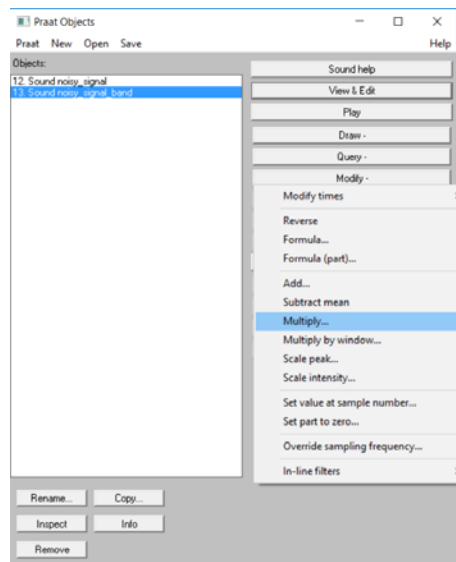


Figure 2: Amplifying a sound object in Praat

Play with the parameters of the designed filter until you remove as much noise as possible. Which type of filter have you chosen to clean the signal? Which cut-off frequency have you set?