Perception of Musical Sounds

Practical

In today's practical you should:
1. understand narrow- and wide-band spectrograms of speech,
2. be able to estimate pitch and formant frequencies of speech,
3. understand how a male voice can be turned into female voice,
4. turn speech into music

1. Narrow and wide-band spectrograms
Open Praat. In the “Praat objects” window, select “Record mono sound” from the “New” menu. Make sure that “internal microphone” and “44100 Hz” are on.
When you are ready, click on “record” and say "Where were you a year ago". Click on “Stop”, give your name to the recording and “Save to list”.

Your recording is automatically added to the “objects” list in the PRAAT object window.

Select the recording, and click on the “Edit” button on the right.
A new window appears, with the waveform at the top, and a spectrogram at the bottom.

Play the signal by clicking on the horizontal bar (the one that contains “total duration”) at the bottom of the window. Remove start and stop silences by dragging over their waveforms and pressing delete.
Now check that the spectral analysis parameters are appropriate for a **narrow-band** spectrogram of male speech. Go to the Spectrum menu in the new window and select Spectrogram settings… Set them like this:

Then your spectrogram should look approximately like this:

Now set the spectrum parameters appropriate for a **wide-band** spectrogram of male speech by changing the window length from 0.04s to 0.004s.

The new spectrogram should look like this:
2. **Estimate the pitch** of your voice from the narrow-band spectrogram (eg find the 10-th harmonic and click on it), and estimate some formant frequencies by clicking on them. Praat has an automatic formant tracker that you can toggle with Formant menu Show formants. Zoom into part of the wideband spectrogram by selecting about 0.3s of speech and then clicking the sel button (bottom left). Notice that with each pitch pulse the formants ring (like a decaying sinewave).

3. **Changing the sex of the voice**
   Make sure that the sound that you recorded is still selected. Then, in the list of actions go to Convert – and select Change Gender… Make the values in the dialogue box as follows:
These changes will raise the formant frequencies by a factor of 1.2, and linearly shift the pitch so that it is centered around 200 Hz. Try just doing one of those manipulations at a time. Look at the spectrograms and notice the changes to the pitch and to the formant values.

4. Turning speech into music
Select your original recording. In the top-level Praat menu select Open Praat script… and open Desktop:SpeechMusic. In the Run menu of the script you have opened select Run.

Leave the parameters as they are, click OK and then you end up with a printout of notes in the Info window and four new sound objects Chain1,2,3 and name10x10x100. The last one is the sum of the other three which correspond to the note tracks of first three formants. Play them and look at their spectrograms.

Then try altering the parameters. The notes can be made to overlap by choosing a Duration of each note that is longer than the Inter-Note Onset Interval. The shorter this interval, the more notes are generated and the longer the program takes to run, but the more speech-like the sound becomes. The smaller the Bandwidth(Hz); the longer the decay-time of each note and the more musical the sound becomes.

You can delete objects from the list by selecting them and then clicking Remove (bottom left).